FOR YOUR SAFETY
If you smell gas:

1. **Open windows.**
2. **DO NOT try to light any appliance.**
3. **DO NOT use electrical switches.**
4. **DO NOT use any telephone in your building.**
5. **Extinguish any open flame.**
6. **Leave the building.**
7. **Immediately call your local gas supplier after leaving the building. Follow the gas supplier's instructions.**
8. **If you cannot reach your gas supplier, call the Fire Department.**

⚠ WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.

Some objects will catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

BANANZA

BANANZA® B-Series

Direct, Gas-Fired, Industrial Air Handler

Installation, Operation & Service Manual

B-350
B-650
B-1000
B-2000
B-3000
B-4000
B-5000

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the Installation, Operation and Service Manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.

NOT FOR RESIDENTIAL USE

INTERTEK ETL CM LISTED C US

CANADA: 100% OUTSIDE AIR ONLY

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your serviceman with necessary information.

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www.bananza.com

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SECTION 1: AIR HANDLER SAFETY

Your Safety is Important to Us! This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections.

Installation, service and annual inspection of air handlers must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation or service of this equipment.

This air handler is designed for heating non-residential indoor spaces. Do not install in residential spaces. These instructions, the layout drawing, local codes and ordinances and applicable standards that apply to gas piping, electrical wiring, ventilation, etc. must be thoroughly understood before proceeding with the installation.

Protective gear is to be worn during installation, operation and service. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended.

Before installation, check that the local distribution conditions, nature of gas and pressure and adjustment of the appliance are compatible.

For additional copies of the Installation, Operation and Service Manual, please contact Bananza.

Gas-fired appliances are not designed for use in atmospheres containing flammable vapors or dust or atmospheres containing chlorinated or halogenated hydrocarbons. Recirculated room air may be hazardous if containing flammable solids, liquids, and gases; explosive materials; and/or substances which may become toxic when exposed to heat (i.e. refrigerants, aerosols, etc.).

1.1 Description of Operation

This air handler is a direct, gas-fired, fresh-air appliance. It is designed for indoor or outdoor installation with fresh outdoor air delivered to the burner. The air handler is factory-tested to fire with natural gas or LPG (check the air handler's rating plate for information on the appropriate gas). The burner flame will modulate to maintain the selected discharge air temperature or room air temperature, depending on the selected remote panel. *See Page 107, Section 18*. For maximum temperature rise, *See Page 121, Table 23*.

The air handler may be provided with several different controls and options to meet various application requirements. Be sure to read this entire manual before installation and start-up.

1.2 Inspection and Setup

The air handler was inspected and operated prior to shipment. Immediately upon receipt of the air handler, check the fuel and electrical characteristics of the air handler and verify that they match the fuel and electrical supply available. Verify that the specifications on the air handler rating plate match the order. Check the air handler for any damage that may have occurred during shipment. If any damage is found, file a claim with the transporting agency. Do not refuse shipment. Check the installation location to ensure proper clearances to combustibles. *See Page 7, Section 3.1*.

Any small options which do not come attached to the air handler (i.e. remote panel or disconnect) will be found inside the air handler.

Larger accessories (i.e. legs, stand, filter section) may either ship with the air handler or separately. Check the bill of lading for information.

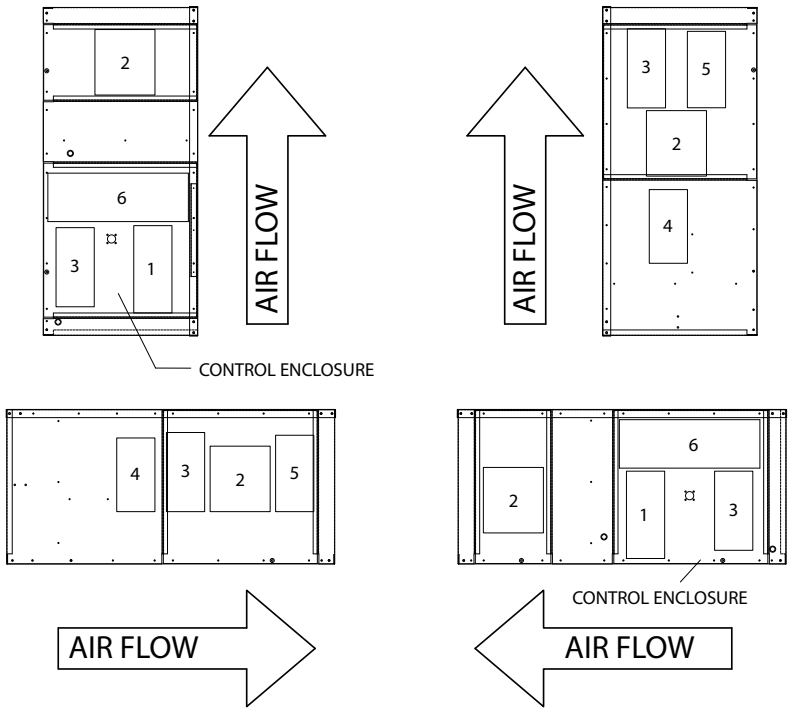
If the air handler must be temporarily stored (ie. job site is not ready for installation of the air handler), the air handler should be set on 4" x 4" (10 cm x 10 cm) pieces of timber on the ground in a protected area. Cover the air handler to protect it from the environment.

1.3 Safety Labels and Their Placement

Product safety signs or labels should be replaced by product user if they are no longer legible. Please contact Bananza or your BANANZA® independent distributor to obtain replacement signs or labels. *See Page 2, Figure 1 through Page 4, Figure 5*.

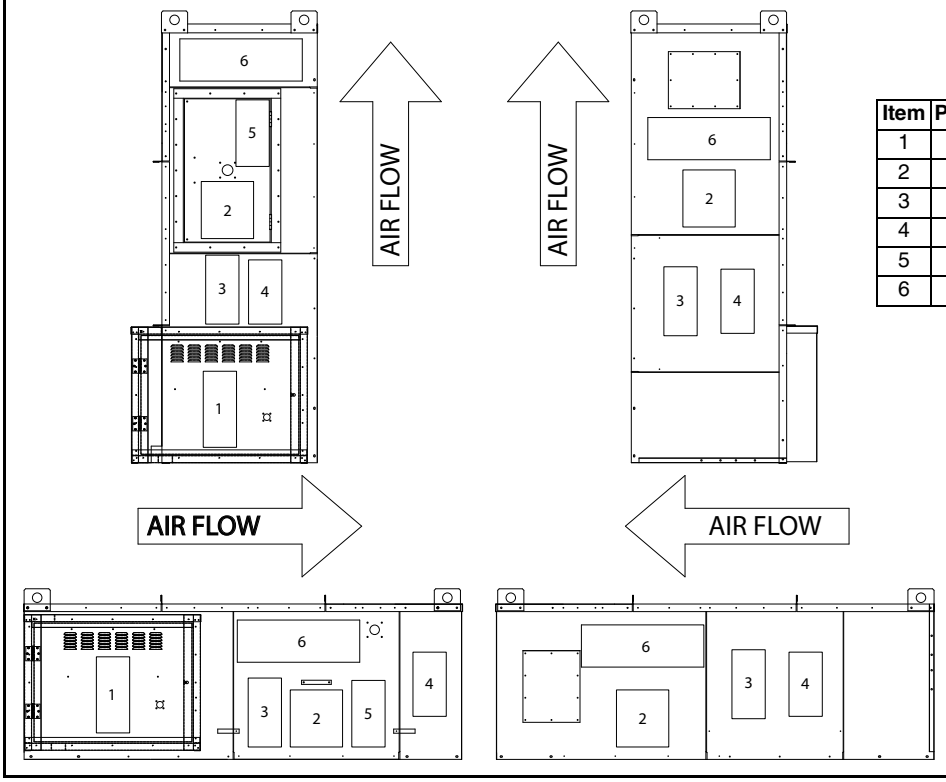
1.4 Label Placement

FIGURE 1: B-350



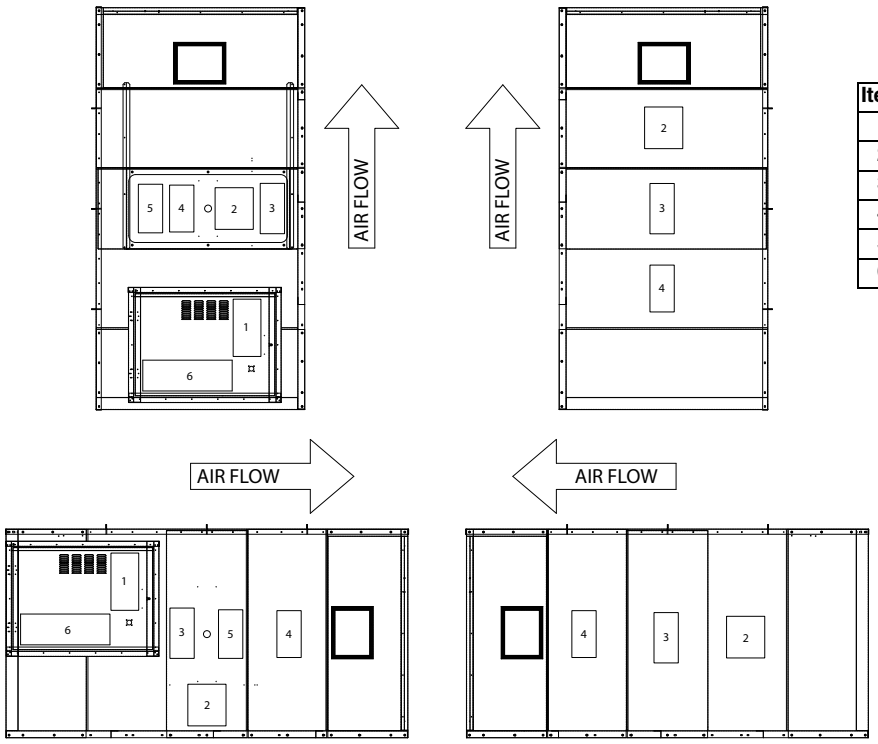
Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070004	Label Fire Hazard
4	91070005	Label Falling Hazard
5	91070006	Label Burn Hazard
6	19205	Bananza Logo Label

FIGURE 2: B-650 and B-1000



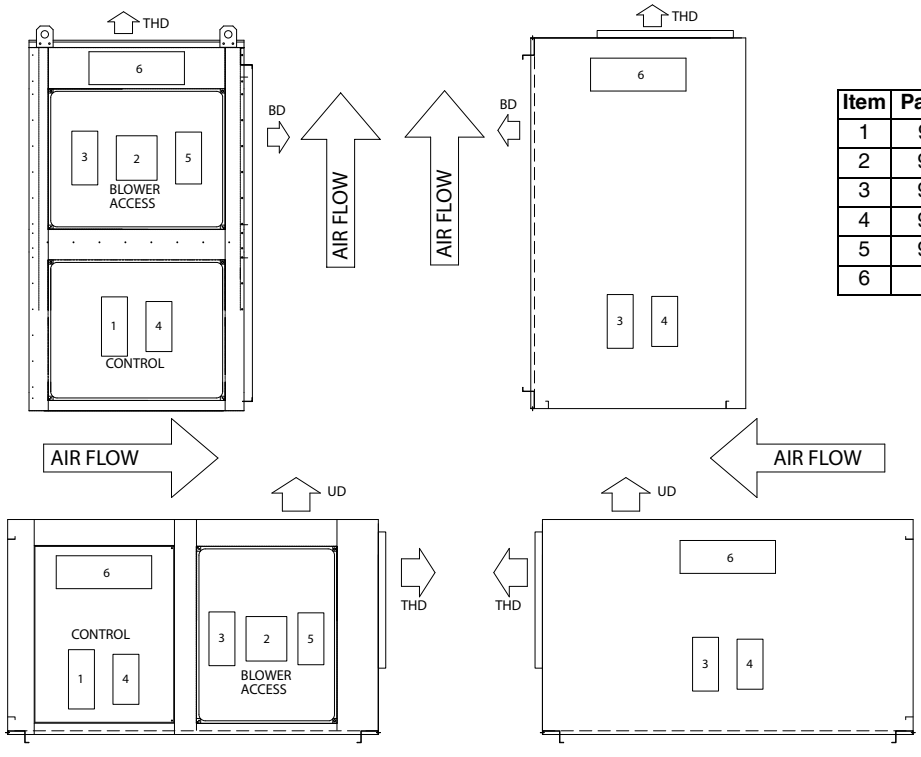
Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070004	Label Fire Hazard
4	91070005	Label Falling Hazard
5	91070006	Label Burn Hazard
6	19205	Bananza Logo Label

FIGURE 3: B-2000 and B-3000



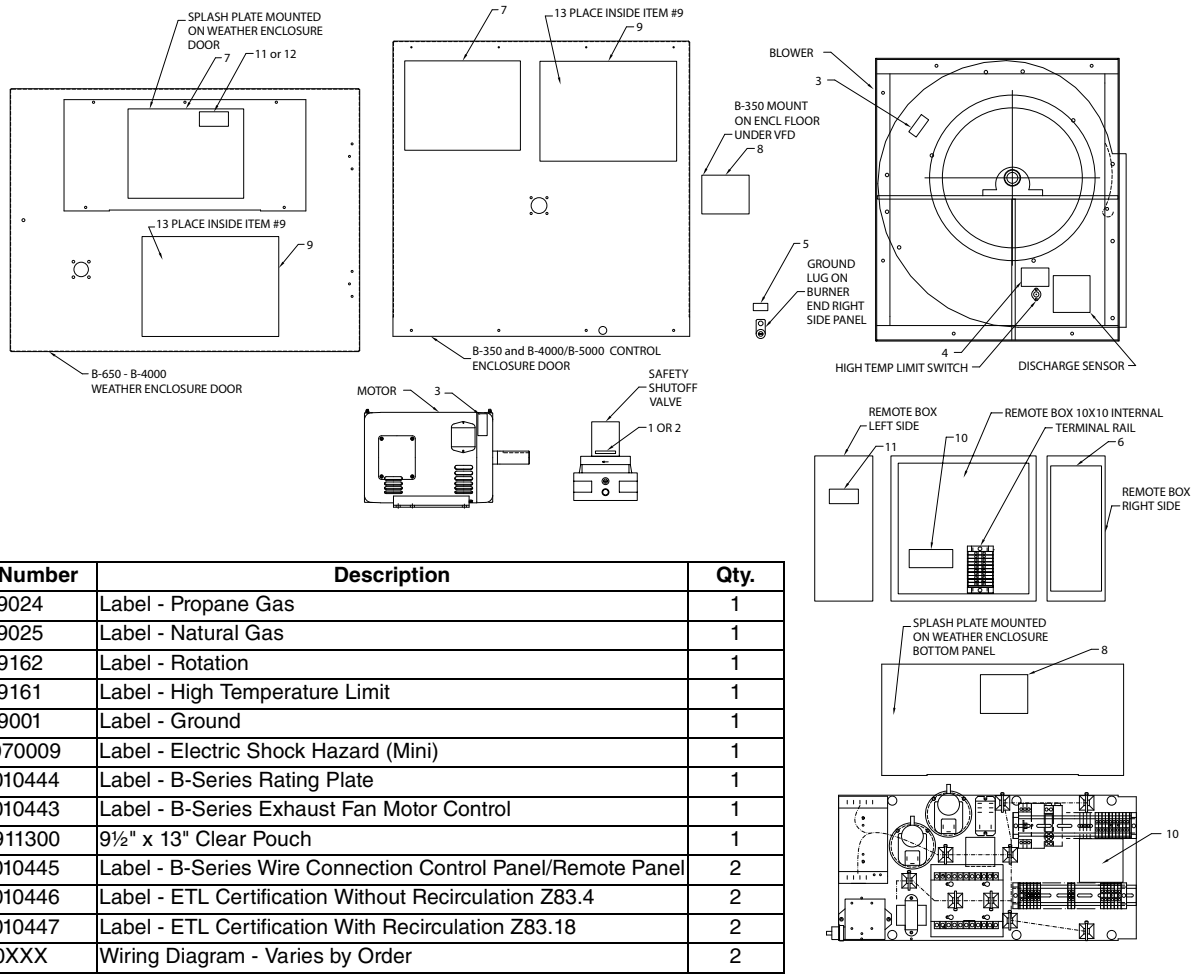
Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070004	Label Fire Hazard
4	91070005	Label Falling Hazard
5	91070006	Label Burn Hazard
6	19205	Bananza Logo Label

FIGURE 4: B-4000 and B-5000



Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070004	Label Fire Hazard
4	91070005	Label Falling Hazard
5	91070006	Label Burn Hazard
6	19205	Bananza Logo Label

FIGURE 5: B-Series Interior



Item	Part Number	Description	Qty.
1	19024	Label - Propane Gas	1
2	19025	Label - Natural Gas	1
3	19162	Label - Rotation	1
4	19161	Label - High Temperature Limit	1
5	19001	Label - Ground	1
6	91070009	Label - Electric Shock Hazard (Mini)	1
7	91010444	Label - B-Series Rating Plate	1
8	91010443	Label - B-Series Exhaust Fan Motor Control	1
9	90911300	9½" x 13" Clear Pouch	1
10	91010445	Label - B-Series Wire Connection Control Panel/Remote Panel	2
11	91010446	Label - ETL Certification Without Recirculation Z83.4	2
12	91010447	Label - ETL Certification With Recirculation Z83.18	2
13	80XXX	Wiring Diagram - Varies by Order	2

SECTION 2: INSTALLER RESPONSIBILITY

⚠ WARNING

Explosion Hazard

Equipment must have access to uncontaminated air at all times.

Failure to follow these instructions can result in death, injury or property damage.

The installer is responsible for the following:

- To install and commission the air handler, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. Bananza recommends the installer contact a local building inspector or Fire Marshal for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access to air handler for servicing.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To ensure there is adequate air circulation around the air handler and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To assemble or install any accessories or associated duct work using best building practices.
- To supply a carbon dioxide (CO_2) sensor with AM, VAV and FR style units, limiting the room concentration of CO_2 to 5,000 ppm.
- To properly size supports and hanging materials.

2.1 Corrosive Chemicals

⚠ CAUTION

Product Damage Hazard

Do not use equipment in area containing corrosive chemicals.

Refer to appropriate Material Safety Data Sheets (MSDS).

Failure to follow these instructions can result in product damage.

Bananza cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

** **Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the air handler components will be greatly reduced. The location of the outside air supply must be carefully chosen to supply outside air, free of these compounds, to the burners whenever the presence of these compounds is suspect. Warranty will be invalid if the air handler is exposed to halogenated hydrocarbons.*

2.2 Required Equipment

When lifting of the equipment is required, the installing contractor is responsible for supplying or arranging for the appropriate lifting equipment so that the air handler and accessories may be placed in a safe manner.

The qualified installer or service technician is responsible for having the appropriate equipment for the safe installation and start-up of a direct-fired air handler. Tools required to commission the equipment include, but are not limited to, the following:

- Various screwdriver types and sizes
- Various adjustable wrenches
- Torque wrenches
- Pipe wrenches sized appropriately for the gas train components

- Drill motor and various drills
- U-tube manometer or gas pressure gauge
- Volt meter
- Clamp style ammeter
- Belt tension gauge

SECTION 3: CRITICAL CONSIDERATIONS

⚠WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.

Some objects will catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

⚠WARNING

Explosion Hazard

Fresh air supply duct and burner housing must be purged with fresh air four times before every ignition.

Explosive vapors will ignite if not evacuated before ignition attempt.

Failure to follow these instructions can result in death, injury or property damage.

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the air handler to prevent fire hazards. Combustibles are materials that may catch on fire and include common items such as wood, paper, rubber, fabric, etc. **Maintain clearances to combustibles at all times for safety.**

Check the clearances on each air handler being installed to make sure the product is suitable for your application and the clearances are maintained. Clearances to combustibles for models B-350 - B-3000 are 12"(30.5 cm) on the control enclosure side and 6"(15.2 cm) on all other surfaces. Clearances to combustibles for models B-4000 and B-5000 are 6"(15.2 cm) on all surfaces. Read and follow the safety guidelines below:

- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this air handler or any other appliance.
- Maintain clearances from heat sensitive material, equipment and workstations.

Clearances to combustibles do not denote clearances for accessibility. Minimum clearance for access is 48" (122 cm). Minimum clearance for accessibility applies to the control enclosure, blower access panel and filter access panel (when equipped).

The stated clearances to combustibles represent a surface temperature of 90° F (50° C) above room temperature (90° F [50° C] plus ambient temperature). Building materials with a low heat tolerance (i.e. plastics, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent materials are protected from degradation.

• Maintain clearances from vehicles parked below the air handler. *See Page 9, Section 4.4*.

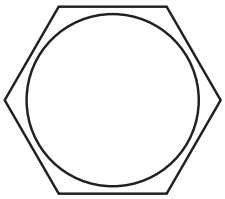
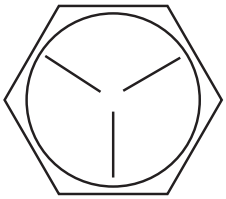
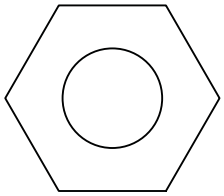
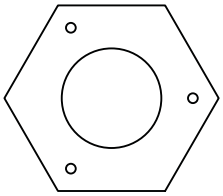
3.2 Purge of Supply Duct

If this heating unit is to be installed indoors, and its outdoor air supply ducted from outdoors, ANSI Standards Z83.18 and Z83.4 require that all supply duct shall be purged a minimum of four times prior to any ignition attempt. If the volume of the outdoor air supply duct exceeds the heating unit's ability to complete the required four air changes prior to ignition, you must contact the factory to purchase an extended purge card of the appropriate duration to meet this requirement.

3.3 Hardware

Unless otherwise specified, all hardware must be torqued to settings on *Page 8, Table 1*.

Table 1: Recommended Torque Settings

Bolt Head Grade Marking		
Nut Grade Marking		
Bolt Size	**Grade 2**	**Grade 5**
10-24	27 in•lb	42 in•lb
1/4-20	65 in•lb	101 in•lb
5/16-18	11 ft•lb	17 ft•lb
3/8-16	19 ft•lb	30 ft•lb

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1- latest revision, Natural Gas and Propane Installation Code.

4.2 Installation Codes

Installations must be made in accordance with the Standard for the Installation of Air-Conditioning and Ventilating Systems, NFPA 90A - latest revision for the installation of air conditioning and ventilating systems.

4.3 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409 - latest revision.

Canada: Refer to Standard CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

- In aircraft storage and servicing areas, air handlers shall be installed at least 10’ (3 m) above the upper surface of wings or of engine enclosures of the highest aircraft which may be housed in the hangar. The measurement shall be made from the wing or the engine enclosure (whichever is higher from the floor) to the bottom of the air handler.
- In shops, offices and other sections of aircraft hangars communicating with aircraft storage or servicing areas, air handlers shall be installed not less than 8’ (2.4 m) above the floor.
- Suspended or elevated air handlers shall be so located in all spaces of aircraft hangars that they shall not be subject to injury by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended air handlers for recurrent maintenance purposes.

4.4 Parking Structures and Repair Garages

Installation in garages must be in accordance with the following codes:

United States: Standard for Parking Structures NFPA 88A - latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

- Air handlers must not be installed less than 8’ (2.4 m) above the floor. Mininum clearances to combustibles must be maintained from vehicles parked below the air handler.
- When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.

4.5 Electrical

Electrical connection to air handler must be in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

4.6 Venting

The venting must be installed in accordance with the requirements within this manual and the following codes:

United States: Refer to NFPA 54/ANSI Z223.1- latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

4.7 High Altitude

These air handlers are approved for installations up to 2000'(609.6 m) (in the US) and 4500'(1371.6 m) (in Canada) without modification. Consult factory if US installation is above 2000’(609.6 m) or Canadian installation is above 4500’(1371.6 m).

SECTION 5: SPECIFICATIONS

Dimension and estimated weight tables apply to both upright and horizontal units of the same model.

Unless otherwise requested, all direct-fired air handlers are set-up to accept an external static pressure (ESP) of 1 in wc (2.5 mbar). If more external static pressure is required, this needs to be requested with the order as required motor horsepower (HP) may increase from the specifications given *on Page 16, Table 8*.

Air handlers are designed to operate in temperatures as low as -40° F (-40° C).

The legend below details abbreviations used in this section and applies to *Page 10, Figure 6 through Page 15, Figure 11*.

Legend	
BD = Bottom Discharge	OA = Outside Air
CE = Control Enclosure	RA = Return Air (optional)
GC = Gas Connection	RD = Right Discharge
ED = End Discharge	TD = Top Discharge
LD = Left Discharge	

FIGURE 6: B-350 Upright Model Dimensions

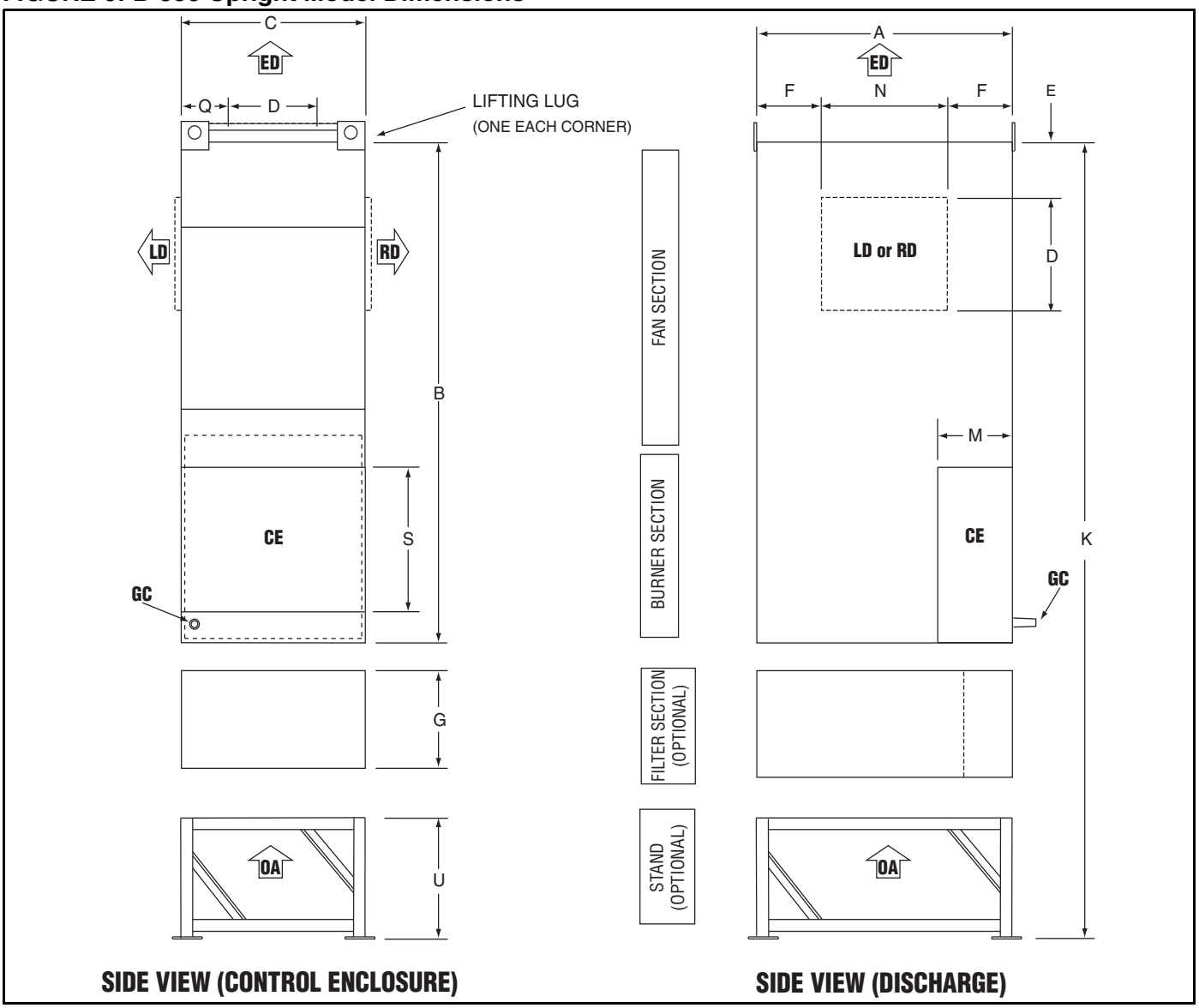


Table 2: B-350 Dimensions

Model		A	B	C	G	H	K	L	M	P	Q	S	U	W	X	Z
B-350	(in)	32.3	60.3	28.3	27.1	3.0	117.4	1.5	8.0	1.8	3.1	35.2	30.0	25.2	38.4	10.0
	(cm)	82.0	153.2	71.9	68.8	7.6	298.2	3.8	20.3	4.6	7.9	89.4	76.2	64.0	97.5	25.4

Model		CFM	D	E	F	N
B-350	(in)	1,000-3,000	10.4	6.8	11.5	9.3
		4,000	13.8	7.6	8.2	15.8
	(cm)	1,000-3,000	26.4	17.3	29.2	23.6
		4,000	35.1	19.3	20.8	40.1

FIGURE 7: B-350 Horizontal Model Dimensions

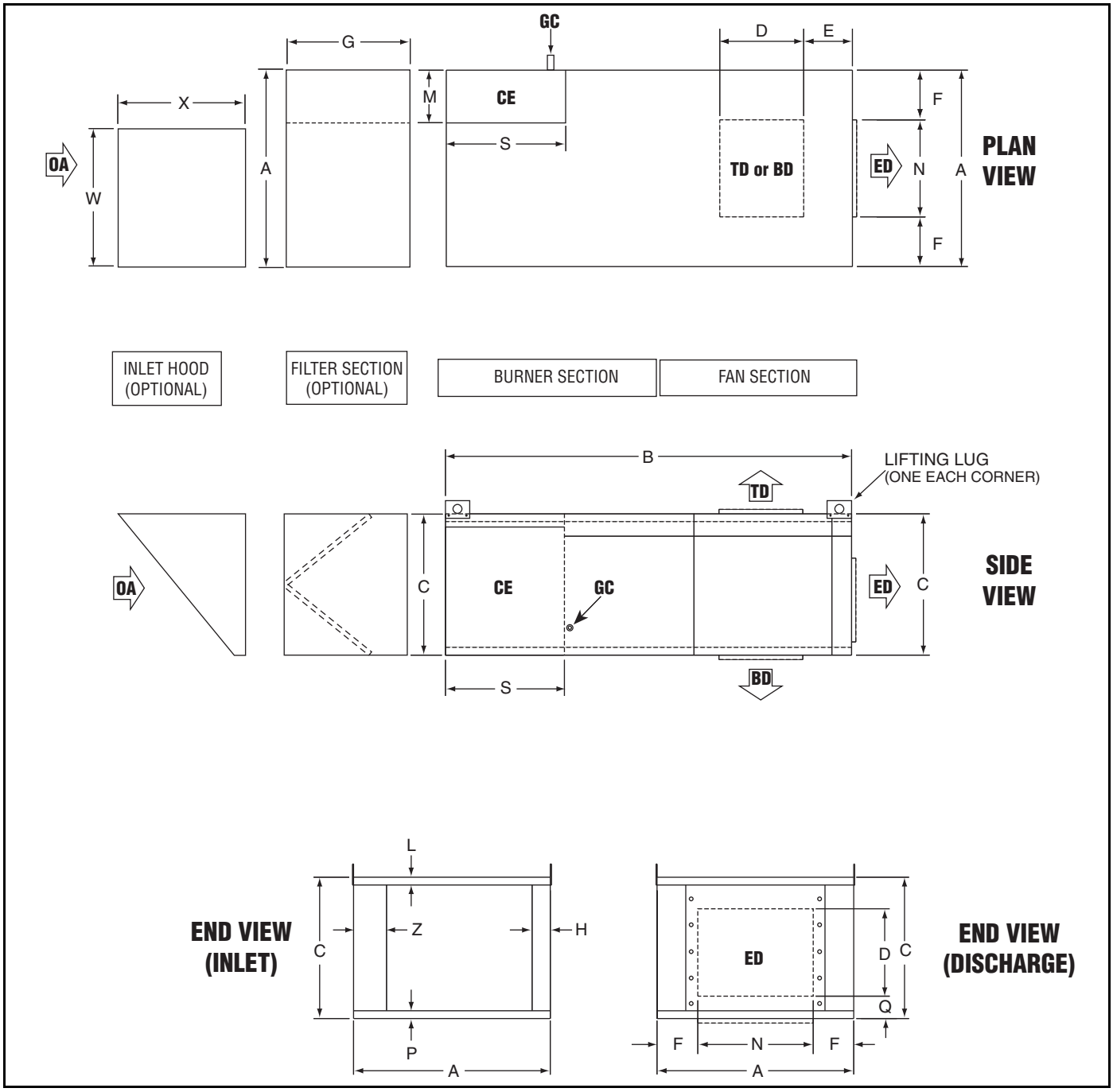


Table 3: B-350 Weights

Model		Air Handler	Stand	Inlet Hood	Splash Plate	Filter Section	Roof Curb	Discharge Head	Dampers	Suspension Kit	Legs (each)	Skid
B-350	(lb)	450	40	50	20	100	30	45	40	30	35	50
	(kg)	204.1	18.1	22.7	9.1	45.4	13.6	20.4	18.1	13.6	15.9	22.7

FIGURE 8: B-650, B-1000, B-2000 and B-3000 Upright Model Dimensions

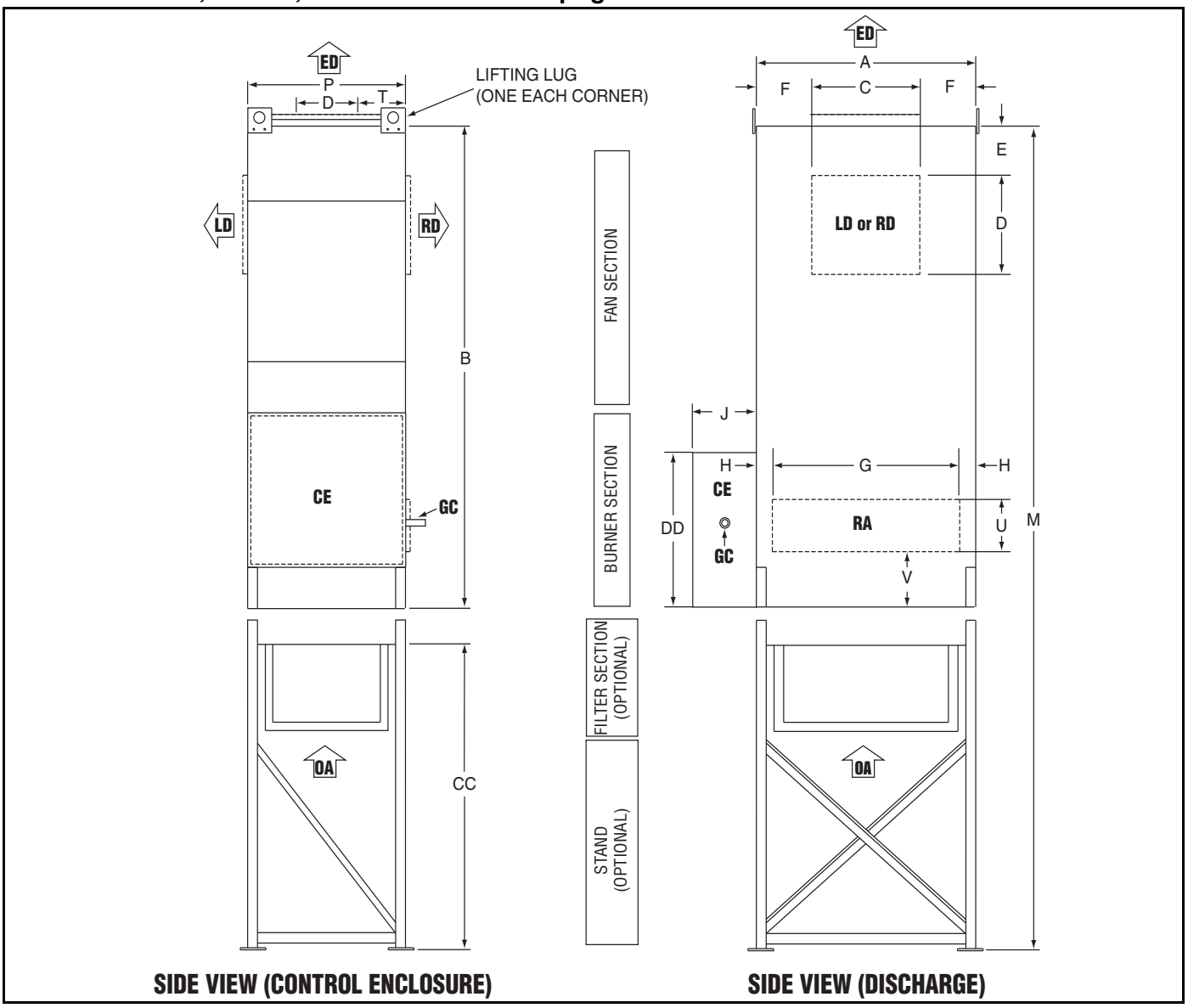


Table 4: B-650, B-1000, B-2000 and B-3000 Dimensions

Model		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
B-650/ B-1000	(in)	44.2	92.3	22.0	19.0	10.5	11.1	37.9	3.2	14.0	31.1	6.6	*	29.6	32.7	48.1	35.1
	(cm)	112.3	234.4	55.9	48.3	26.7	28.2	96.3	8.1	35.6	79.0	16.8	*	75.2	83.1	122.2	89.2
B-2000	(in)	56.0	116.2	31.5	26.0	13.8	12.3	44.3	6.0	17.0	45.0	5.5	188.1	52.6	56.1	69.6	23.3
	(cm)	142.2	295.1	80.0	66.0	35.0	31.2	112.5	15.2	43.2	114.3	14.0	477.8	133.6	142.5	176.78	59.2
B-3000	(in)	68.0	116.2	36.8	36.8	17.0	15.6	56.3	6.0	17.0	57.0	5.5	188.7	56.6	60.1	69.6	23.3
	(cm)	172.7	295.1	93.5	93.5	43.2	39.62	143.0	15.2	43.2	144.8	14.0	477.8	143.8	152.7	176.78	59.2

Model		S	T	U	V	W	Y	Z	AA	BB	CC	DD	FF	GG	HH
B-650/ B-1000	(in)	1.6	3.0	10.0	3.4	56.4	37.2	34.0	38.8	28.8	*	28.6	1.1	41.0	0.5
	(cm)	4.1	7.6	25.4	8.6	143.2	94.5	86.3	98.6	73.2	*	72.6	2.8	104.1	1.3
B-2000	(in)	1.5	3.9	26.5	6.0	89.3	44.0	31.0	49.7	52.8	72.0	33.0	1.1	52.0	0.4
	(cm)	3.8	9.9	67.3	15.2	226.8	111.8	78.7	126.2	134.1	182.9	83.8	2.8	132.1	1.0
B-3000	(in)	1.5	3.9	30.5	6.0	86.9	44.0	31.0	64.1	56.8	72.0	33.0	1.1	66.4	0.4
	(cm)	3.8	9.9	77.5	15.2	220.7	111.8	78.7	162.8	144.3	182.9	83.8	2.8	168.7	1.0

Model*		M	CC (Stand Height)
B-650/ B-1000	(in)	145.3	53
	(cm)	369.1	134.6
	(in)	164.3	72
	(cm)	417.3	182.9

FIGURE 9: B-650, B-1000, B-2000 and B-3000 Horizontal Model Dimensions

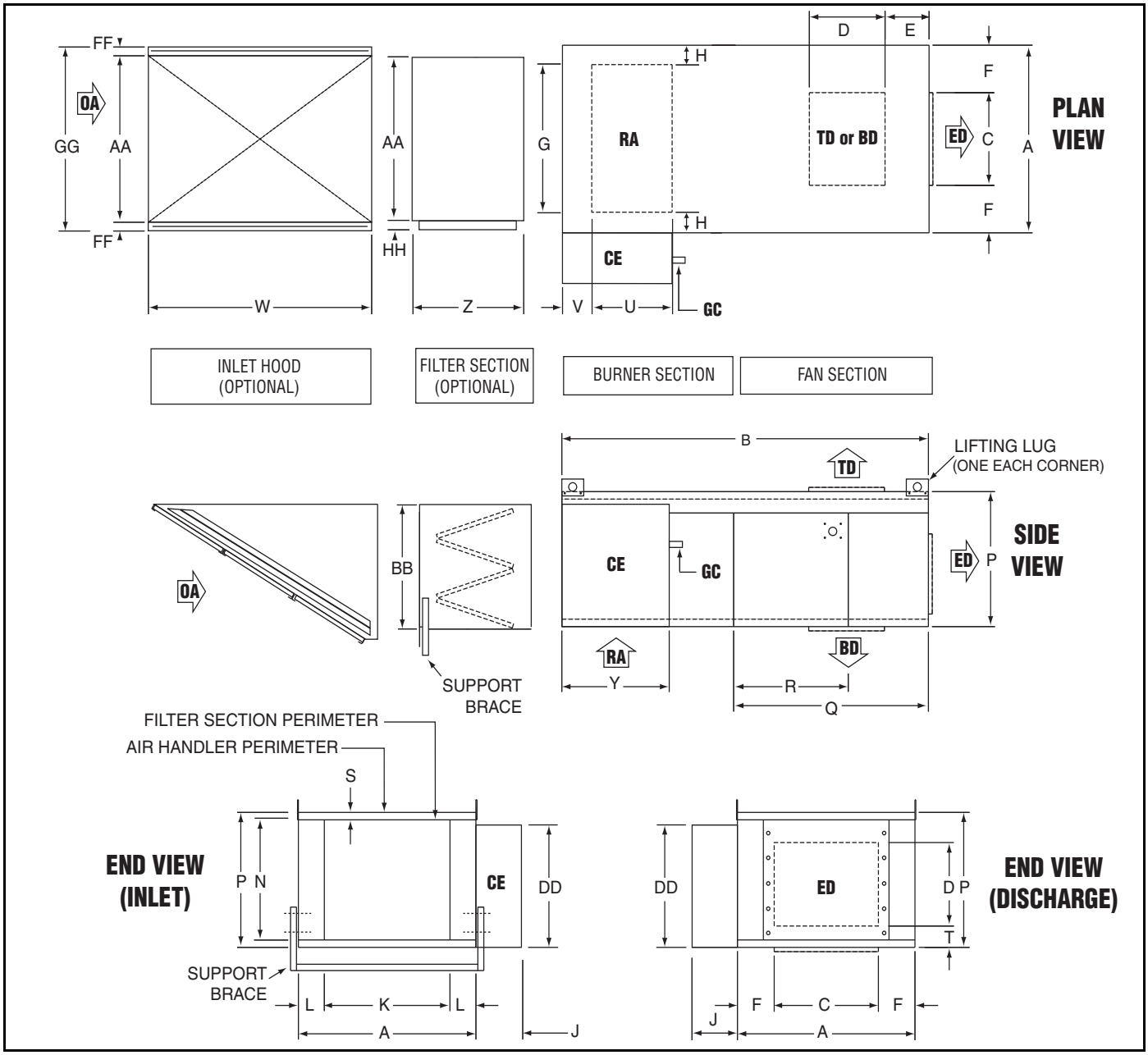


Table 5: B-650, B-1000, B-2000 and B-3000 Weights

Model		Air Handler	Stand	Inlet Hood	Splash Plate	Skid	Filter Section	Roof Curb	Discharge Head	Dampers	Legs (each)	Suspension Kit
B-650/ B-1000	(lb)	700	100	60	50	140	60	80	60	60	60	40
	(kg)	317.5	45.4	27.2	22.7	63.5	27.2	36.3	27.2	27.2	27.2	18.1
B-2000	(lb)	1400	200	150	60	340	150	125	100	100	60	80
	(kg)	638	90.7	68.0	27.2	154.2	68.0	56.7	45.4	45.4	27.2	36.3
B-3000	(lb)	1650	300	220	90	365	250	200	125	150	80	N/A
	(kg)	748.4	136.1	99.8	40.8	165.6	113.4	90.7	56.7	68.0	36.3	N/A

FIGURE 10: B-4000 and B-5000 Upright Model Dimensions

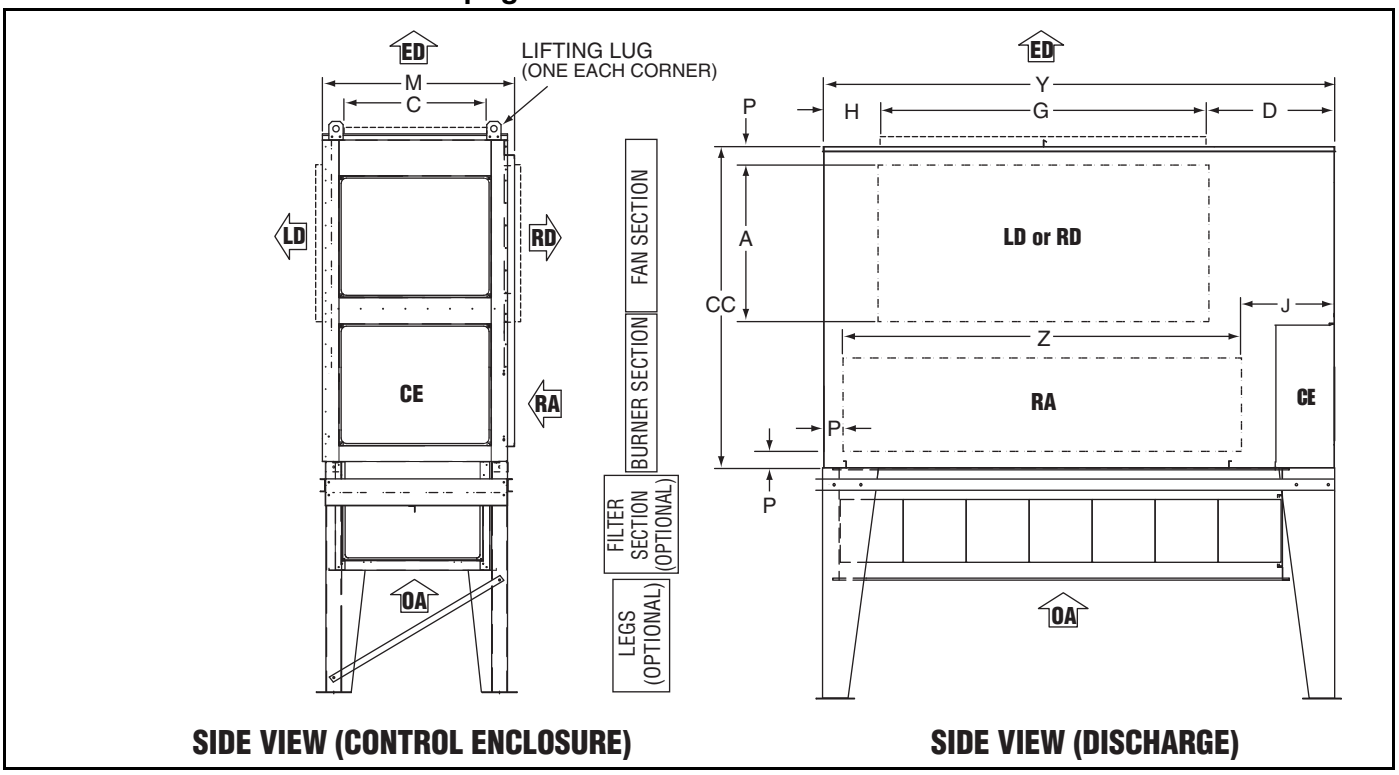


Table 6: B-4000 and B-5000 Dimensions

Model		A	C	F	G	H	J	M	N	P	V	W	X	Y	Z	BB	CC	DD	JJ
B-4000	(in)	40.6	31.5	12.4	88.3	23.8	31.6	60.25	160.4	5.8	86.0	137.5	35.0	160.0	122.5	5.0	100.1	28.6	58.0
	(cm)	103.1	80.0	31.5	224.3	60.5	80.3	153.0	407.4	14.7	218.4	349.3	88.9	406.4	311.2	127.0	254.3	72.6	147.3
B-5000	(in)	46.3	35.3	6.5	99.1	18.2	31.6	60.25	160.4	5.8	86.0	137.5	35.0	160.0	122.5	5.0	100.1	28.6	58.0
	(cm)	117.6	89.7	16.5	251.7	46.2	80.3	153.0	407.4	14.7	218.4	349.3	88.9	406.4	311.2	12.7	254.3	72.6	147.3

Model		Bottom Discharge			End/Top Discharge		
		D	FF	GG	D	FF	GG
B-4000	(in)	47.6	23.8	88.3	47.9	24.1	87.8
	(cm)	120.9	60.5	224.3	121.7	61.2	223.0
B-5000	(in)	42	18.2	99.1	42.4	18.7	98.6
	(cm)	106.7	46.2	251.7	107.7	47.5	250.4

FIGURE 11: B-4000 and B-5000 Horizontal Model Dimensions

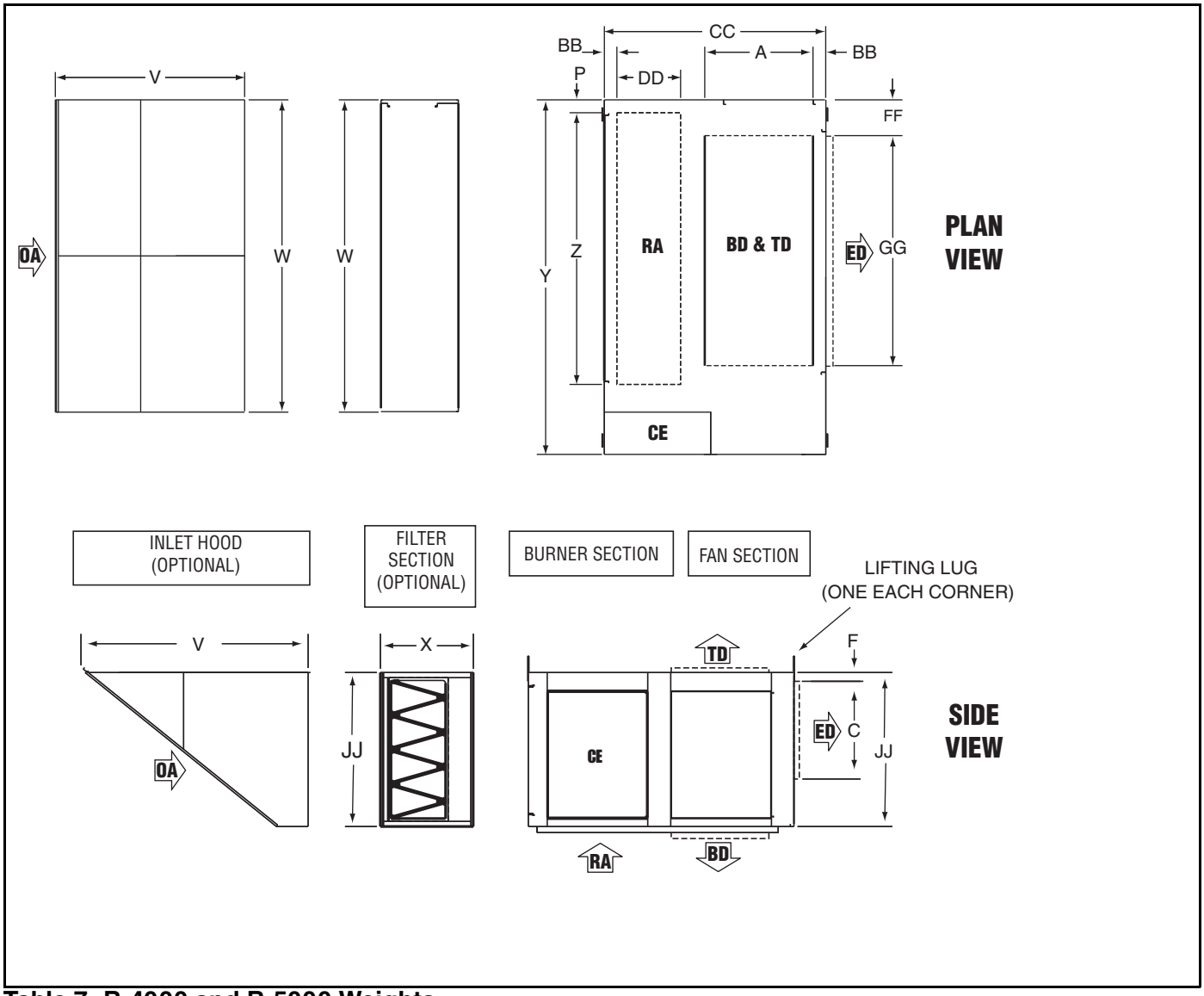


Table 7: B-4000 and B-5000 Weights

Model		Air Handler	Inlet Hood	Splash Plate	Service Platform	Roof Curb	Filter Section
B-4000	(lb)	3,350	480	170	325	267	580
	(kg)	1520.0	217.7	77.1	147.4	121.1	263.1
B-5000	(lb)	3,800	480	170	325	267	580
	(kg)	1723.7	217.7	77.1	147.4	121.1	263.1

Table 8: B-Series Selection Guide

CFM	Model	Motor HP @ 1 in wc External Static Pressure	dB "A" @ 1 in wc External Static Pressure**	Heat Input @ Max. Temperature Rise (Btu/h) x 1000		Minimum Inlet Gas Pressure (in wc)***	Manifold Size (in NPT)
				NG	LPG		
1,000	B-350	2	70	97	76	7	.75
2,000	B-350	2	70	194	151	7	.75
3,000	B-350	3	70	292	227	7	.75
4,000	B-350	3	70	389*	302	7	.75
4,000	B-650	3	69	432	346	7	1
5,000	B-650	3	68	540	432	7	1
6,000	B-650	5	67	648	518	7	1
7,000	B-650	5	66	756*	605	7	1
8,000	B-650	5	66	800*	691	7	1
9,000	B-650	7.5	67	800*	778	7	1
10,000	B-650	7.5	68	800*	800	7	1
7,000	B-1000	5	66	756	605	7	1.25
8,000	B-1000	5	66	864	691	7	1.25
9,000	B-1000	7.5	67	972	778	7	1.25
10,000	B-1000	7.5	68	1080	864	7	1.25
11,000	B-1000	10	68	1188	950	7	1.25
12,000	B-1000	10	69	1296	1037	7	1.25
13,000	B-1000	N/A	N/A	1404	1123	7	1.25
14,000	B-1000	N/A	N/A	1512	1210	7	1.25
12,000	B-2000	7.5	73	1296	1037	9	1.5
14,000	B-2000	10	73	1512	1210	9	1.5
16,000	B-2000	10	76	1728	1382	9	1.5
18,000	B-2000	15	77	1944	1555	9	1.5
20,000	B-2000	15	77	2160	1728	9	1.5
22,000	B-2000	20	77	2376	1901	9	1.5
25,000	B-2000	20	77	2700	2160	9	1.5
25,000	B-3000	15	74	2700	2160	11	2
27,500	B-3000	15	75	2970	2376	11	2
30,000	B-3000	20	76	3240	2592	11	2
32,500	B-3000	25	77	3510	2808	11	2
35,000	B-3000	25	79	3780	3024	11	2
37,500	B-3000	30	79	4050*	3240	11	2
40,000	B-3000	N/A	N/A	4320*	3456	11	2
35,000	B-4000	25	77	3780	N/A	Consult Factory	1.5 - 3
37,500	B-4000	30	77	4050			1.5 - 3
40,000	B-4000	30	77	4320			1.5 - 3
42,500	B-4000	40	77	4590			1.5 - 3
45,000	B-4000	40	77	4860			1.5 - 3
47,500	B-4000	40	78	5130			1.5 - 3
45,000	B-5000	30	77	4860	N/A		1.5 - 3
47,500	B-5000	30	77	5130			1.5 - 3
50,000	B-5000	40	77	5400			1.5 - 3
52,500	B-5000	40	78	5670			1.5 - 3
55,000	B-5000	40	78	5940			1.5 - 3
57,500	B-5000	40	79	6210			1.5 - 3
60,000	B-5000	50	80	6480			1.5 - 3

**Temperature rise at this CFM is less than the maximum temperature rise.*

***dB "A" is measured at 10'(3m) from unducted discharge.*

****Maximum Inlet Gas Pressure:ANSI - Compliant Manifold (B-350 - B-3000) = 14 in wc (34.9 mbar)*
ANSI- Compliant Manifold (B-4000 and B-5000) = 5 psi (344.7 mbar)
FM and XL Insurance (formerly-IRI) - Compliant Manifold (All Models) = 5 psi (344.7 mbar)

Table 9: Estimated Pressure Drop of Accessory Components

Model	Airflow Range (CFM)	Inlet Hood with Filters		Filter Section		Inlet/Discharge Damper		Inlet Hood with Moisture Limiters	
		in wc	mbar	in wc	mbar	in wc	mbar	in wc	mbar
B-350	1,000 - 2,000	0.25	0.62	0.25	0.62	0.10	0.25	-	-
	3,000 - 4,000	0.40	1.0	0.50	1.25	0.10	0.25	-	-
B-650	4,000 - 6,000	0.25	0.62	0.25	0.62	0.10	0.25	-	-
	7,000 - 10,000	0.40	1.0	0.50	1.25	0.10	0.25	-	-
B-1000	7,000 - 10,000	0.25	0.62	0.25	0.62	0.10	0.25	-	-
	11,000 - 14,000	0.40	1.0	0.50	1.25	0.10	0.25	-	-
B-2000	12,000 - 16,000	0.25	0.62	0.25	0.62	0.10	0.25	-	-
	18,000 - 25,000	0.40	1.0	0.50	1.25	0.10	0.25	-	-
B-3000	25,000 - 30,000	0.35	087	0.75	1.87	0.10	0.25	-	-
	32,500 - 40,000	0.40	1.0	0.85	2.12	0.10	0.25	-	-
B-4000	35,000 - 40,000	0.25	.62	0.25	0.62	0.10	0.25	0.04	0.10
	42,500 - 47,500	0.40	1.0	0.50	1.25	0.10	0.25	0.04	0.10
B-5000	45,000 - 50,000	0.25	.62	0.25	0.62	0.10	0.25	0.04	0.10
	52,500 - 60,000	0.40	1.0	0.50	1.25	0.10	0.25	0.04	0.10

SECTION 6: LIFTING AN AIR HANDLER

⚠ WARNING

Crush Hazard

Use proper lifting equipment and practices.

Failure to follow these instructions can result in death, injury or property damage.

The air handler must be installed in compliance with all applicable codes. The qualified installer or service technician must use best building practices when installing the air handler and any optional equipment. This appliance requires at least 4 CFM (6.8 m^3/h) of outside air per 1,000 Btu/h (.293 kW). Any air handler that recirculates air from the heated space must use the return air opening to prevent any return air from passing over the burner.

Before installation, check that the local distribution condition, nature of gas and gas pressure, and the current state of adjustment of the appliance are compatible. If filters are not installed (via inlet hood or filter section), an air strainer must be installed on the inlet of the air handler with openings less than or equal to 5/8" (16 mm) in diameter. Air inlets must be installed in such a manner that their lowest edge is 19" (500 mm) above any surface. This applies to roof curbs, upright stands and suspended air handlers.

6.1 Lifting an Air Handler

6.1.1 Preparing to Lift the Air Handler

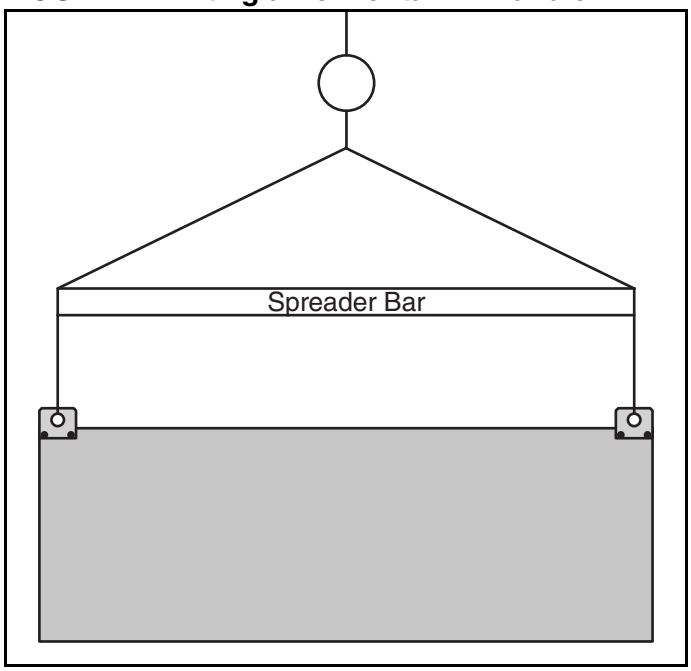
Prior to lifting the air handler, the following steps must be performed:

1. Remove all packaging or banding that attached the air handler to the skid and ensure that the air handler is no longer bound to the skid.
2. Remove all of the accessories or packages that were shipped on the same skid, inside the air handler or inside the control enclosure.
3. Inspect the air handler to:
   - Verify that there is no damage as a result of shipping.
   - Ensure that it is appropriately rated for the utilities available at the installation site.
   - Verify that the lifting lugs are intact, undamaged and secured to the air handler.
   - Ensure factory-installed hardware is torqued as specified.
4. Prepare the installation location to be ready to accept the air handler (i.e. roof curb, mounting stand or legs).

6.1.2 Lifting a Horizontal Air Handler

Lift the air handler into place using all four lifting lugs on the top side of the unit, using a spreader bar across the long axis. *See Page 19, Figure 12*. Next, refer to the applicable portions of *Page 21, Section 7* through *Page 30, Section 10* for specific mounting instructions.

FIGURE 12: Lifting a Horizontal Air Handler



6.1.3 Lifting an Upright Air Handler

All air handlers are shipped in the horizontal position.

Prior to lifting an upright air handler, the following steps must be performed (*See Page 20, Figure 13*):

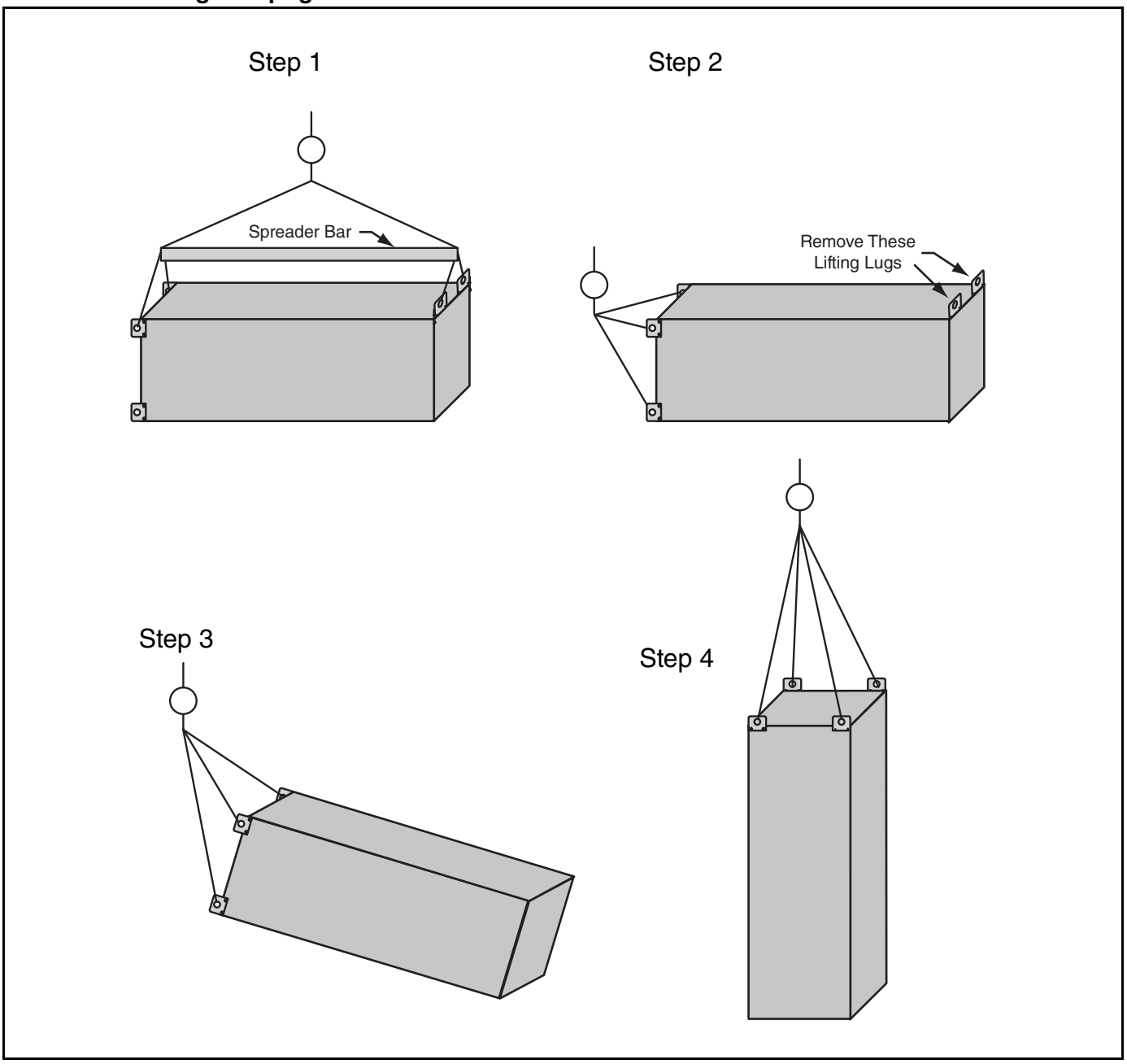
Step 1: The air handler must be lifted using the two lifting lugs on the top of the discharge end and the two lifting lugs on the inlet end, using a spreader bar across the long axis. Lift the air handler off the skid and place it on a flat, clean, dry surface.

Step 2: Remove the lifting lugs on the inlet end of the air handler and re-install hardware.

Step 3: Use all four lifting lugs on the discharge end of the air handler to lift the air handler into the upright position.

Step 4: Lift the air handler onto the upright stand or legs.

FIGURE 13: Lifting an Upright Air Handler



SECTION 7: ROOF CURB

⚠ WARNING			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

The roof curbs only support the burner and blower sections of the air handler. Roof curbs are shipped unassembled and require field assembly. Note: Before installation, verify that you have the correct roof curb and that all required components are present. If any are missing, contact your BANANZA® independent distributor.

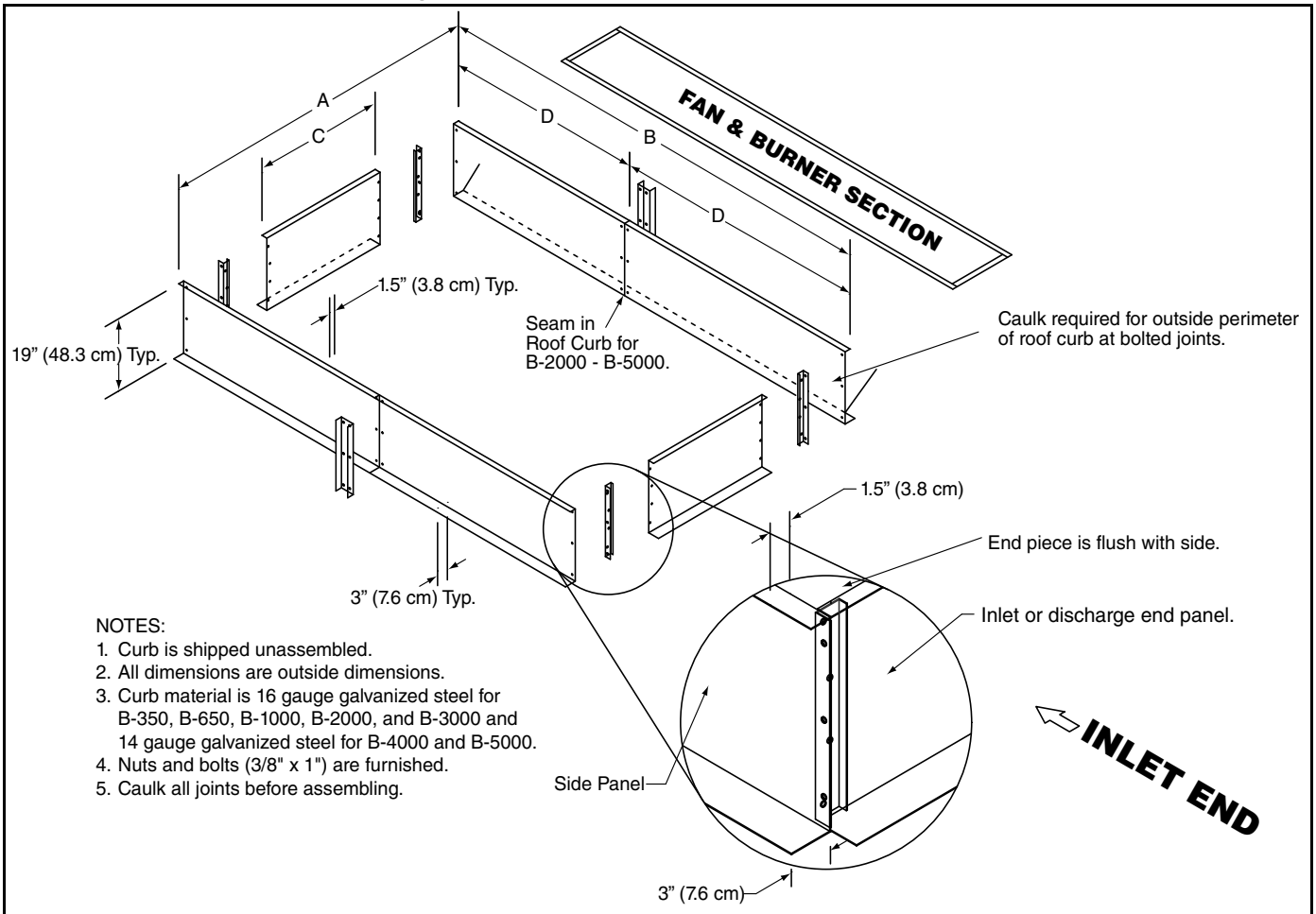
7.1 Roof Curb Assembly and Installation

Assemble roof curb according to the assembly drawing, on *Page 22*, *Figure 14*. Supplied hardware must be torqued to recommended specifications on *Page 8, Table 1*.

Place the curb on the roof in the position in which it will be installed. Check that the diagonal measurements are within 1/8"(3 mm) of each other. To ensure a weatherproof seal between the air handler and the curb, the curb must be level with no twist from end to end. Shim level as required and secure curb to roof deck using best building practices. The curb is self-flashing. Install roofing material as required.

NOTE: Check the installation location to ensure proper clearances to combustibles and clearance for access. *See Page 7, Section 3.1*.

FIGURE 14: Roof Curb Assembly



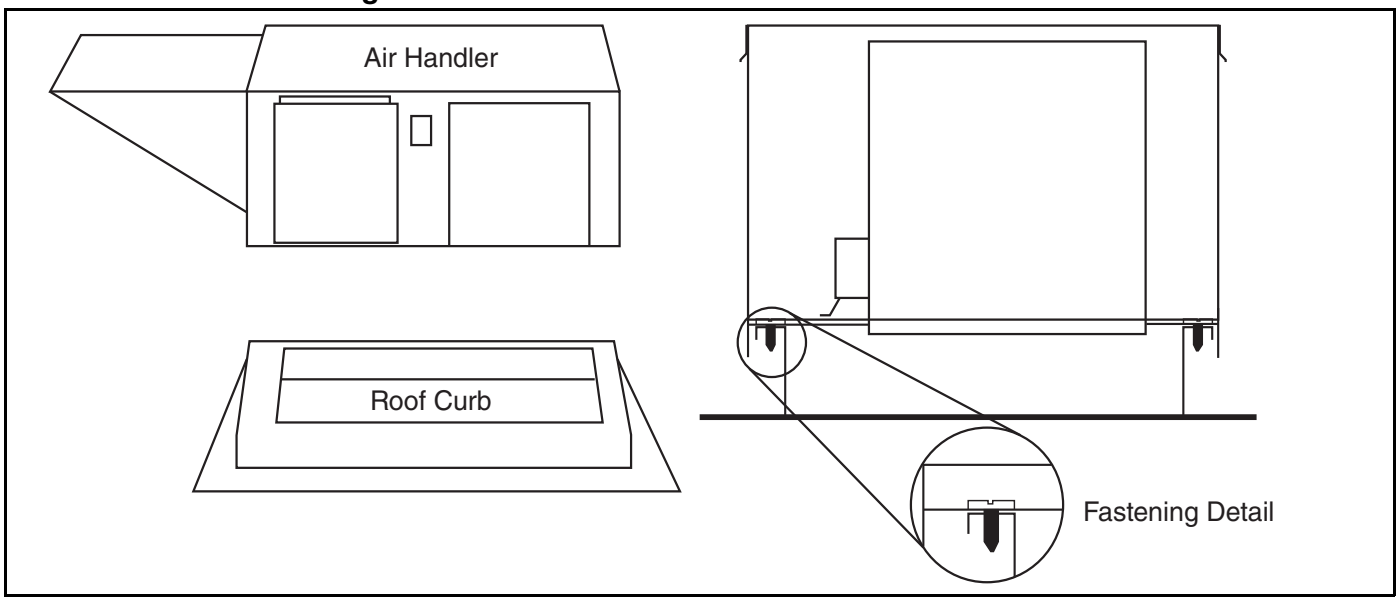
NOTES:
1. Curb is shipped unassembled.
2. All dimensions are outside dimensions.
3. Curb material is 16 gauge galvanized steel for B-350, B-650, B-1000, B-2000, and B-3000 and 14 gauge galvanized steel for B-4000 and B-5000.
4. Nuts and bolts (3/8" x 1") are furnished.
5. Caulk all joints before assembling.

Model		Part Number	A	B	C	D	Weight (lbs)	Weight (kg)	Quantity of 3/8" Nuts, Bolts, Flat Washers
B-350	**(in)** **(cm)**	77351.201	27 68.6	57.5 146.1	28.8 73.2	-	75	34	28
B-650/ B-1000	**(in)** **(cm)**	77050.301	42 106.7	88 223.5	38.8 98.6	-	110	49.9	28
B-2000	**(in)** **(cm)**	77250.301	53 134.6	113 287.0	49.8 126.5	56.5 143.5	140	63.5	40
B-3000	**(in)** **(cm)**	77532	65 165.1	113 287.0	61.8 157.0	56.5 143.5	147	66.7	40
B-4000	**(in)** **(cm)**	80307	98 248.9	157.7 400.7	94.8 240.8	78.8 200.3	267	121.1	40
B-5000	**(in)** **(cm)**	80307	98 248.9	157.7 400.7	94.8 240.8	78.8 200.3	267	121.1	40

7.2 Air Handler Mounting to Roof Curb

After the curb has been installed, the air handler may be placed on the curb. *See Page 23, Figure 15*. After the air handler is in place, the installer must fasten the air handler to the curb. This is accomplished by drilling holes down through the floor of the air handler and into the curb. At least three #12 sheet metal screws (supplied by others) equally spaced on each side must be used to attach the air handler to the curb.

FIGURE 15: Curb Mounting



SECTION 8: UPRIGHT STAND MOUNTING (B-350 - B-3000)

⚠ WARNING			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

When an upright air handler is to be installed on a concrete slab or on the floor, an upright air handler stand should be used. The stand for B-350 is 30" (76.2 cm) tall; stands for B-650 and B-1000 are available at 53" (134.6 cm) or 72" (182.9 cm) tall; stands for B-2000 and B-3000 are 72"(182.9 cm) tall. (Stands are not available for B-4000 and B-5000.) The stand must first be fastened to the concrete slab or floor before the air handler is mounted.

8.1 Upright Stand Installation

To attach the stand to the pad, the stand has four 11/16"(17.4 mm) holes drilled through the stand pads. A 5/8" stud must be installed in the slab for each hole. *See Page 25, Figure 18*. Fasten the stand to the slab with four 5/8" hex nuts and lock washers.

8.2 Attaching Air Handler to Stand

Once the stand is secured to a concrete slab, the air handler may be placed on the stand. Prior to lifting the air handler, apply the foam tape and remove the attaching hardware as described below. The ½" (12.7 mm) thick foam tape (provided by others) must be applied on the stand or filter section. The bolts on the air handler that correspond to the attaching location of the mounting stand must be removed and saved for re-installation to secure the air handler to the stand. Lift the air handler on to the mounting stand. *See Page 19, Section 6.1* for safe lifting practices. Once the air handler is placed on the stand, secure it with the attaching hardware that was removed prior to lifting it in to place. *See Page 24, Figure 16* (B-350) and *Page 24, Figure 17* (B-650 - B-3000).

NOTE: If using the filter section with the upright air handler and stand, the filter section must be set into the stand before the air handler is mounted on the stand. *See Page 46, Section 11.5*.

FIGURE 16: Upright Stand Detail (B-350)

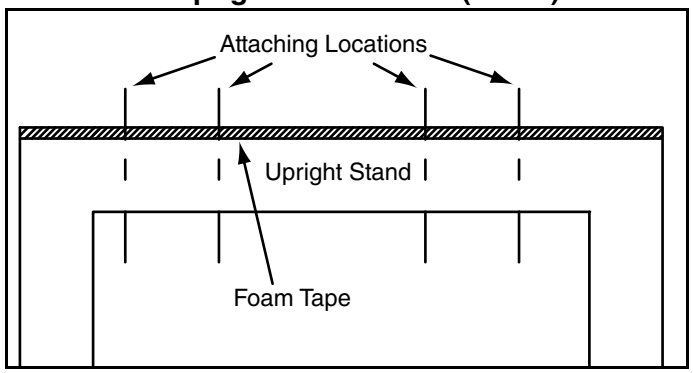


FIGURE 17: Upright Stand Detail (B-650 - B-3000)

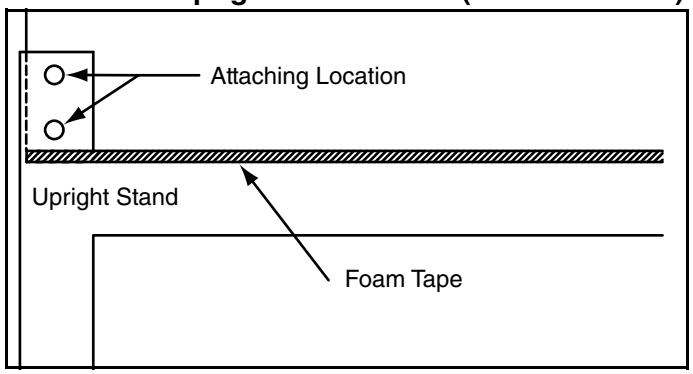
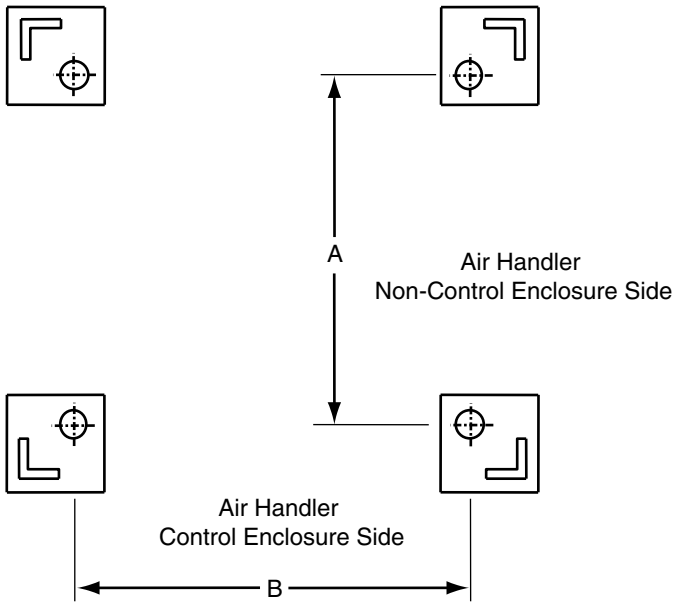


FIGURE 18: Upright Stand Mounting Detail



Model		Part Number	Height	A	B
B-350	(in)	94000.3	30	29.25	25.00
	(cm)		76.2	74.3	63.5
B-650/ B-1000	(in)	91000.2	53	27.50	39.50
	(cm)		134.6	69.9	100.3
	(in)	94000.7	72	27.50	39.50
	(cm)		182.9	69.9	100.3
B-2000	(in)	92000.3	72	51.50	51.50
	(cm)		182.9	130.8	130.8
B-3000	(in)	93000.3	72	55.75	63.50
	(cm)		182.9	141.6	161.3

SECTION 9: LEG MOUNTING

⚠ WARNING			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number.

9.1 Leg Mounting

When mounting an air handler on a concrete slab or directly on the floor, legs may be used. Leg mounting is available for all models in the horizontal configuration and also for the B-4000 and B-5000 in the upright configuration.

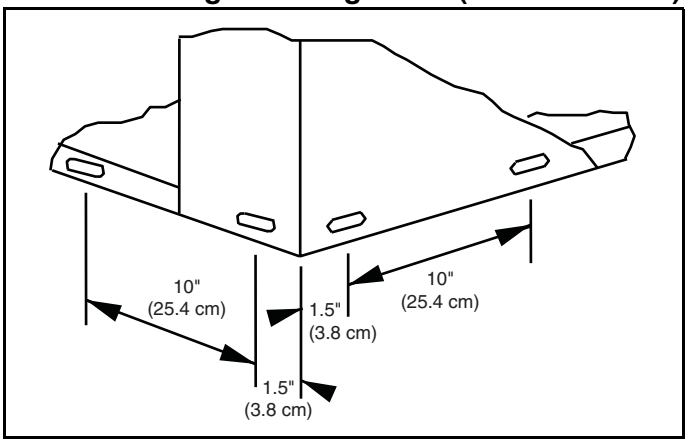
9.2 Leg Mounting - Horizontal Air Handler (B-350 - B-3000)

The 46"(116.8 cm) legs must first be mounted to the air handler before being mounted to the concrete slab or floor. To attach the legs to the air handler, the air handler must first be lifted by the provided lifting lugs. *See Page 19, Section 6.1* for safe lifting practices. In each corner of the bottom of the air handler, four leg-mounting holes will be found. *See Page 26, Figure 19*.

The legs can now be mounted one at a time to the inside of the corner by removing the hardware that occupies each of the bolt locations. Place the leg on the inside of the corner and attach with the previously removed hardware. Missing hardware needs to be added at each bolt location. The required hardware is a 5/16"-18 x 1" grade 5 bolt, a 5/16" flat washer, and a 5/16"-18 grade 5 flange nut.

On Models B-2000 and B-3000, there is a bracket on the inside of each corner that is held in place by the two bolts closest to the corner. This bracket must be removed when the leg is attached to the air handler.

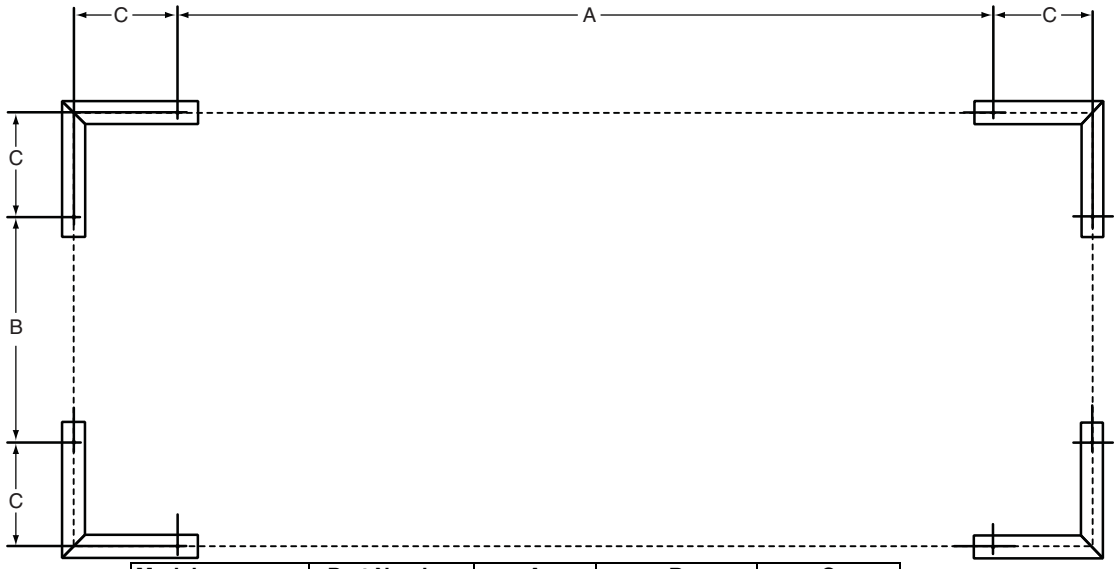
FIGURE 19: Leg Mounting Holes (B-350 - B-3000)



To attach the legs to a concrete slab, the base of each leg is equipped with two 1" holes. Studs capable of accepting 5/8" nuts must be installed in the concrete slab. For stud positioning, *See Page 27, Figure 20*.

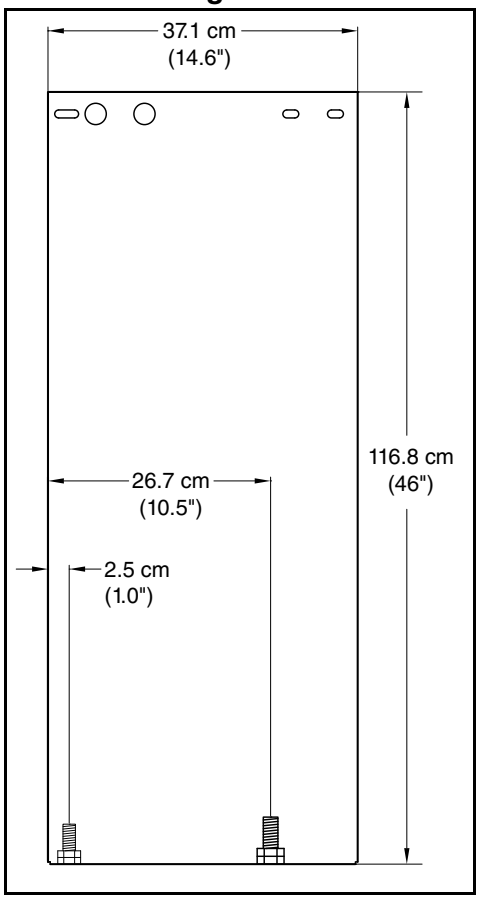
The air handler may now be placed down over the slab studs. The legs should then be bolted down with 5/8" nuts. *See Page 27, Figure 21*.

FIGURE 20: Stud Positioning



Model		Part Number	A	B	C
B-350	(in)	77040.301[W]	38.8	10.8	9.5
	(cm)		98.5	27.4	24.1
B-650/ B-1000	(in)	77040.301[W]	71.0	23.5	9.5
	(cm)		180.3	59.7	24.1
B-2000	(in)	77040.301[W]	95.0	35.0	9.5
	(cm)		241.3	88.9	24.1
B-3000	(in)	77040.301[W]	95.0	47.0	9.5
	(cm)		241.3	119.4	24.1

FIGURE 21: Leg Bolt Detail



9.3 Leg Mounting - Horizontal or Upright Air Handler (B-4000 and B-5000)

Legs are available in heights of 24"(61.0 cm), 36"(91.4 cm), 48"(121.9 cm), 60"(152.4 cm), 72"(182.9 cm), 84"(213.4 cm) or 96"(243.8 cm).

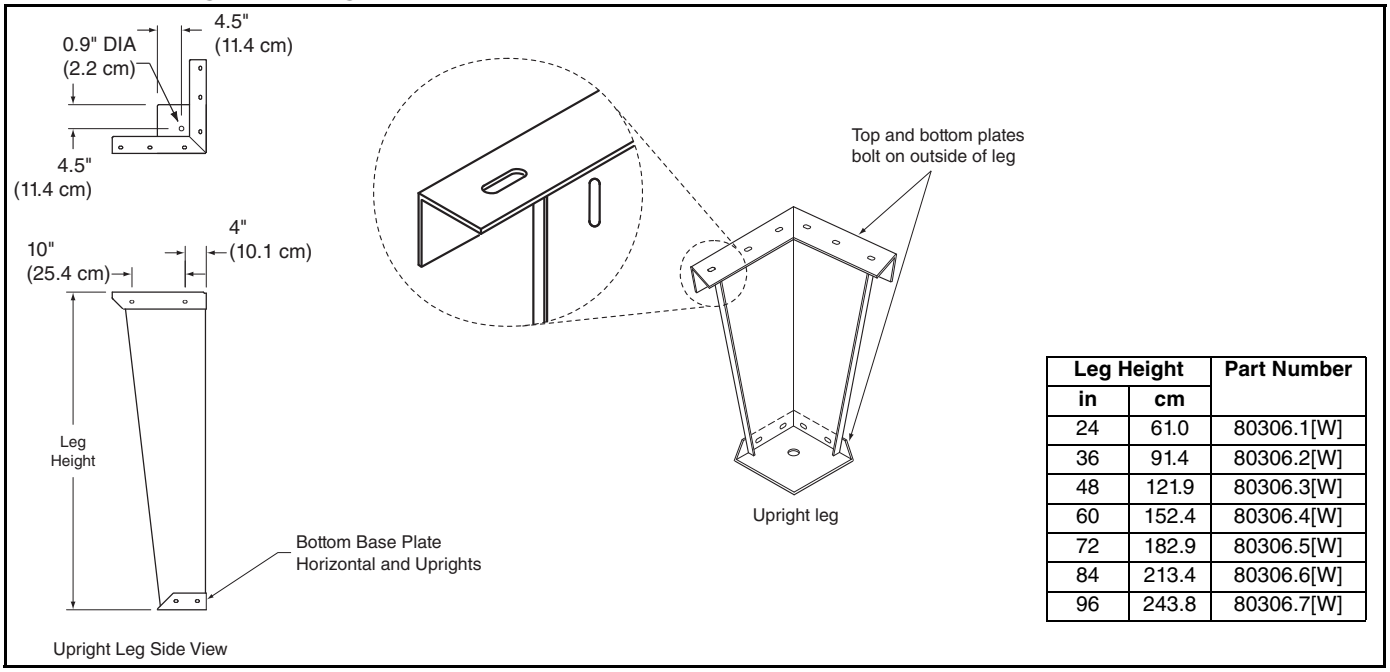
The legs are shipped unassembled. A bottom plate must be bolted to each leg with four 3/8" x 1" bolts, 3/8" flat washers and 3/8" x 16 nuts (See *Page 28, Figure 22*). Then, bolt a top plate to each leg with four 3/8" x 1" bolts, 3/8" flat washers and 3/8" x 16 nuts. The base plate has a 7/8" hole for a 5/8" stud. A 5/8" stud must be installed in the slab for each 7/8" hole. Fasten each leg to slab with four 5/8" hex nuts and lock washers (*See Page 29, Figure 24*).

Once the legs are secured to a suitable base, the air handler now may be mounted. *See Page 19, Section 6.1* for safe lifting practices. Lift the air handler by the top brackets into an upright position and guide it onto the legs.

For units installed in the upright position, see *Page 29, Table 10*. The table provides recommended minimum leg heights to ensure adequate area at air handler inlet to maintain a reasonable air velocity.

NOTE: If using the filter section with the upright air handler and legs, the filter section must be attached to the air handler before it is mounted on the legs. *See Page 46, Section 11.5*.

FIGURE 22: Leg Mounting



Leg Height		Part Number
in	cm	
24	61.0	80306.1[W]
36	91.4	80306.2[W]
48	121.9	80306.3[W]
60	152.4	80306.4[W]
72	182.9	80306.5[W]
84	213.4	80306.6[W]
96	243.8	80306.7[W]

FIGURE 23: Horizontal Air Handler - Leg Pad Location

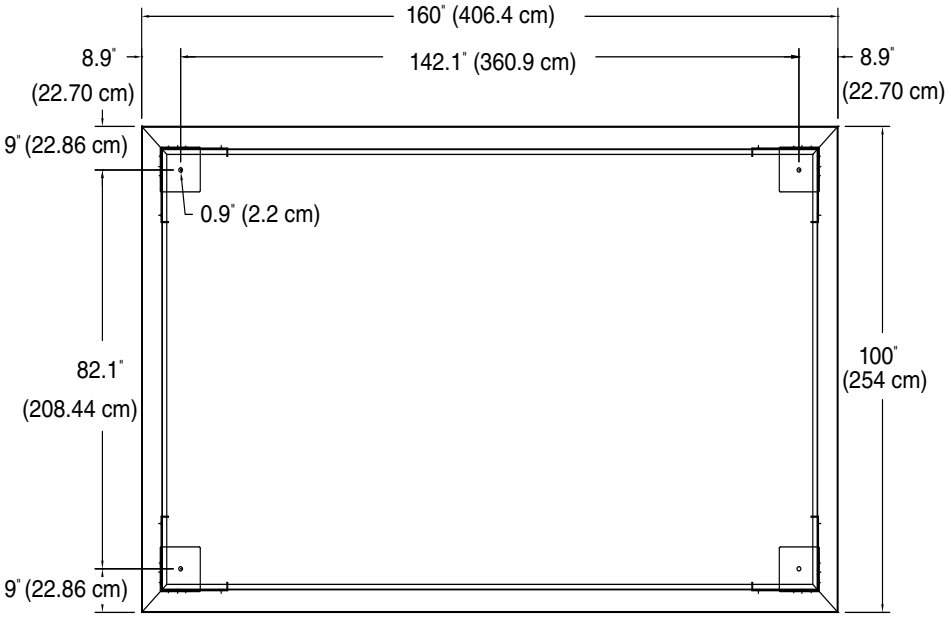


FIGURE 24: Upright Air Handler - Leg Pad Location

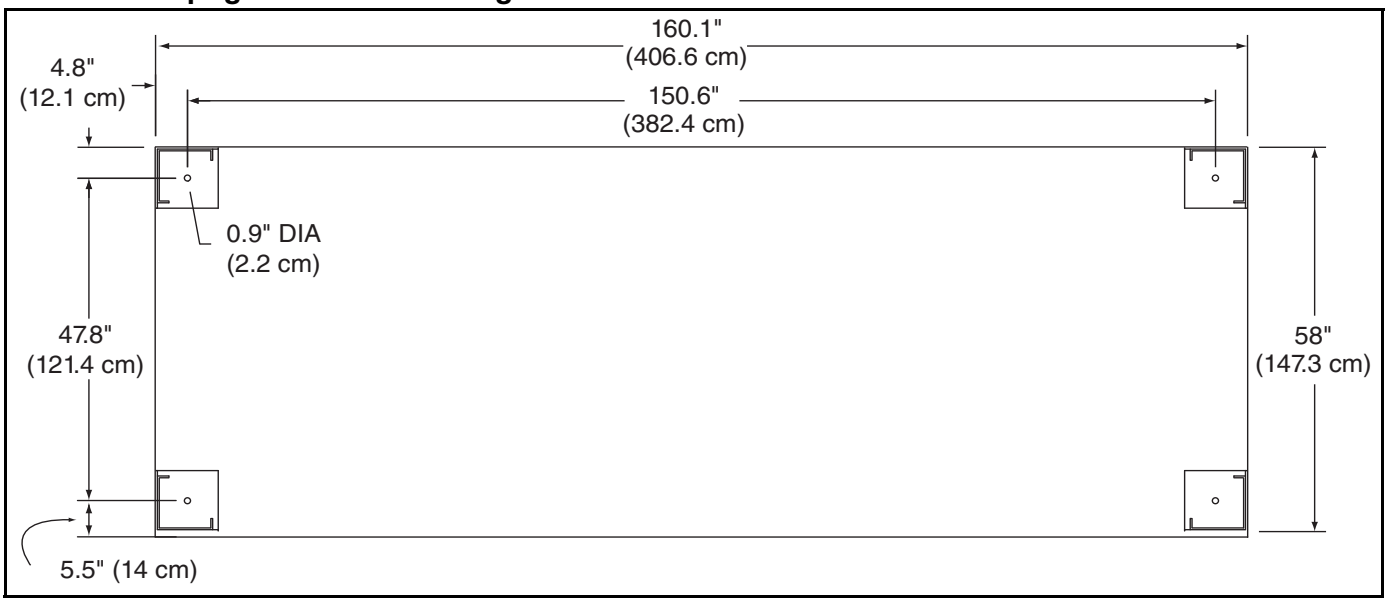


Table 10: Minimum Leg Height for Upright Air Handler (B-4000 - B-5000)

Model	Airflow (CFM)		Minimum Leg Height	
			Without Filter Section	With Filter Section
B-4000	35,000	(in) (cm)	48 121.9	72 182.9
	37,500	(in) (cm)	48 121.9	84 213.4
	40,000	(in) (cm)	60 152.4	84 213.4
	42,500	(in) (cm)	60 152.4	84 213.4
	45,000	(in) (cm)	60 152.4	84 213.4
	47,500	(in) (cm)	60 152.4	96 243.8
B-5000	45,000	(in) (cm)	60 152.4	84 213.4
	47,500	(in) (cm)	60 152.4	96 243.8
	50,000	(in) (cm)	60 152.4	96 243.8
	52,500	(in) (cm)	72 182.9	96 243.8
	55,000	(in) (cm)	72 182.9	96 243.8
	57,500	(in) (cm)	72 182.9	96 243.8
	60,000	(in) (cm)	72 182.9	96 243.8

SECTION 10: INDOOR SUSPENSION MOUNTING - HORIZONTAL AIR HANDLER

⚠ WARNING		
Crush Hazard **Use proper lifting equipment and practices.**	**Crush Hazard** **Check blower assembly per maintenance section.** **Lack of blower assembly maintenance can cause excessive vibration.** **Excessive vibration can cause support failure.**	**Crush Hazard** **Hanging hardware must support equipment weight.** **Do not hang by lifting lugs.**
Failure to follow these instructions can result in death, injury or property damage.		

⚠ WARNING		
Falling Hazard **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.		

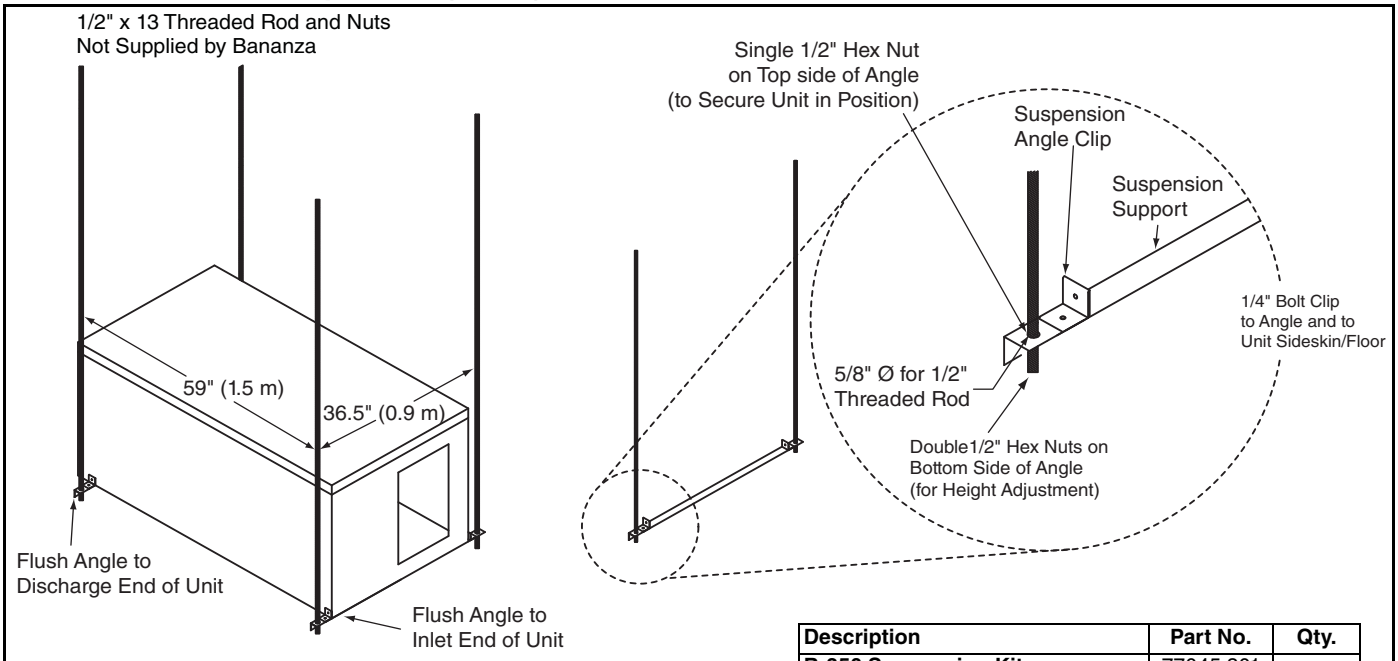
10.1 Suspension Kit Assembly and Installation

The suspension kit for Models B-350 - B-1000 are shipped unassembled and must be assembled prior to installation (Suspension kits are not available for models B-2000 - B-5000).

NOTE: Check to be sure all required components are present. If any are missing, contact your BANANZA® independent distributor.

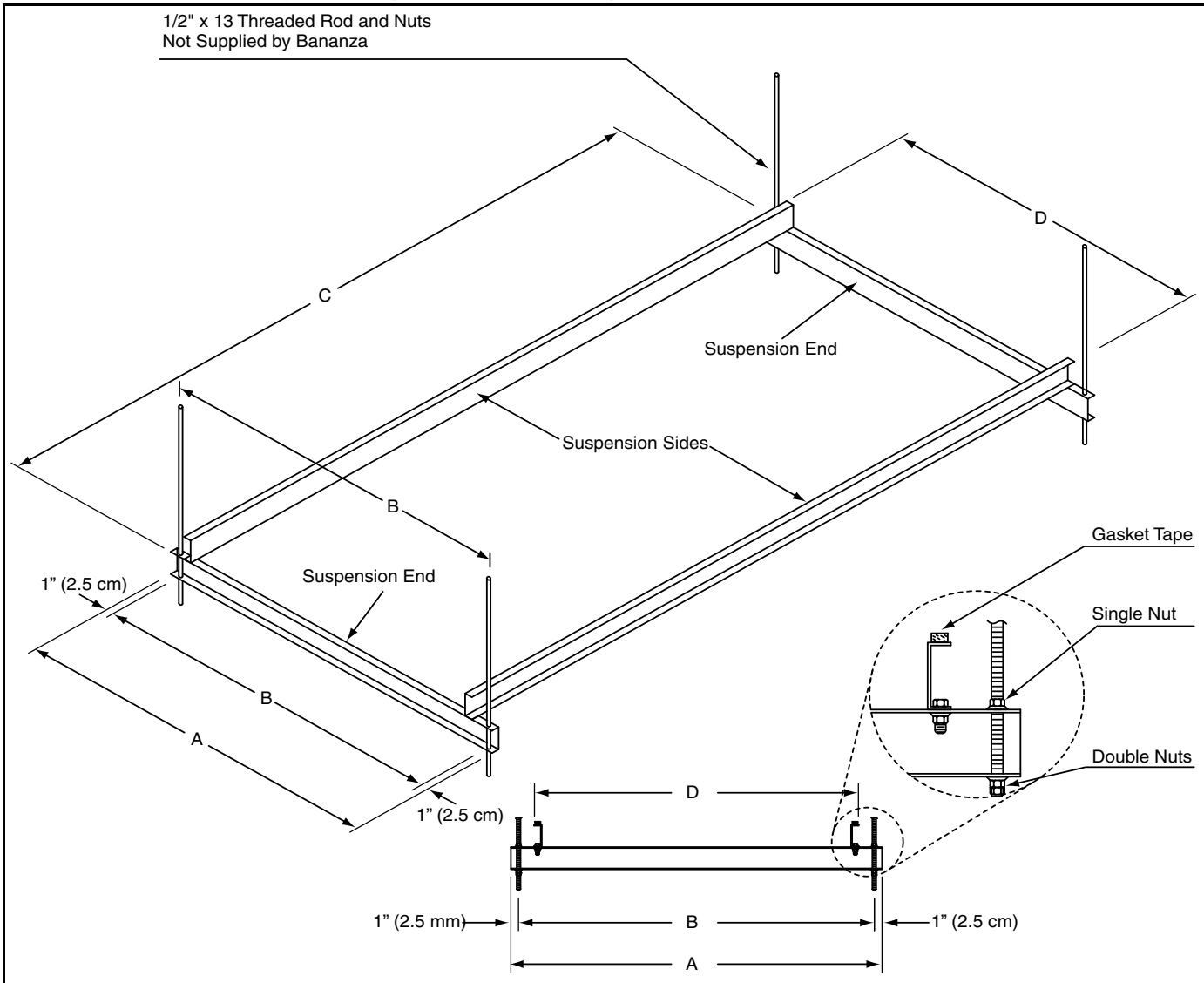
Once the suspension frame is secure, the air handler may be mounted. *See Page 19, Section 6.1* for safe lifting practices.

FIGURE 25: Indoor Suspension (B-350)



Description	Part No.	Qty.
B-350 Suspension Kit	77045.301	
Suspension Angle Assembly	77045.201	2
¼-20x1 Bolt	20813	4
¼-20 Nut	20630	4
¼ Washer	20503	4

FIGURE 26: Indoor Suspension (B-650 and B-1000)



Description	Part No.	Qty.
B-650 and B-1000 Suspension Kit	77046.301	
Suspension Sides	77047.103	2
Suspension Ends	77047.106	2
3/4" x 1/8" Gasket Tape	20623	15' (5m)

Dimensions					
Model		**A**	**B**	**C**	**D**
B-650/	**(in)**	48	46	90	42
B-1000	**(cm)**	121.9	116.8	228.6	106.7

SECTION 11: FILTER SECTION INSTALLATION

⚠ WARNING			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

The B-350, B-4000 and B-5000 filter sections are shipped assembled. The B-650 - B-3000 filter sections are shipped unassembled and must be assembled prior to installation.

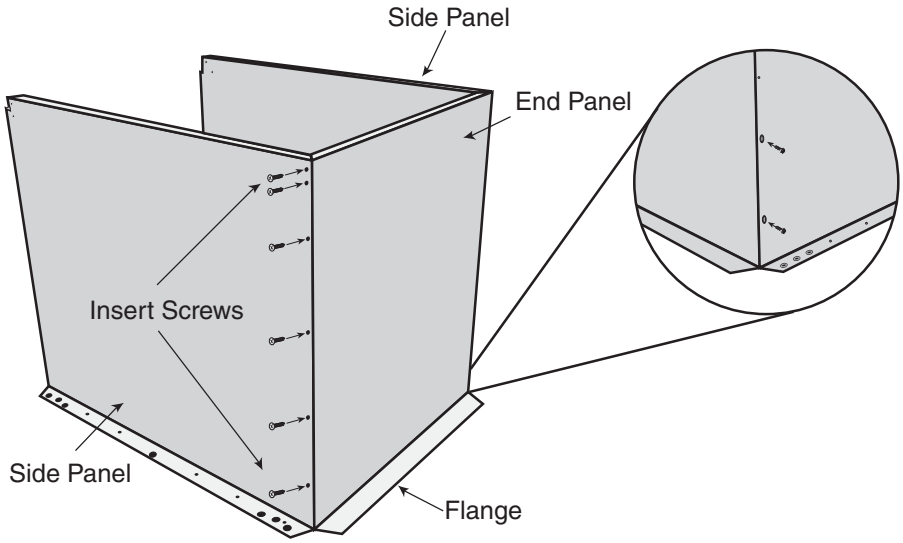
Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number. If the filter section support is necessary, it may be installed prior to attaching the filter section to the air handler. *See Page 44, Section 11.3*.

NOTE: Check to be sure that all required components are present. If any are missing, contact your BANANZA® independent distributor.

11.1 Filter Section Assembly (B-650 and B-1000)

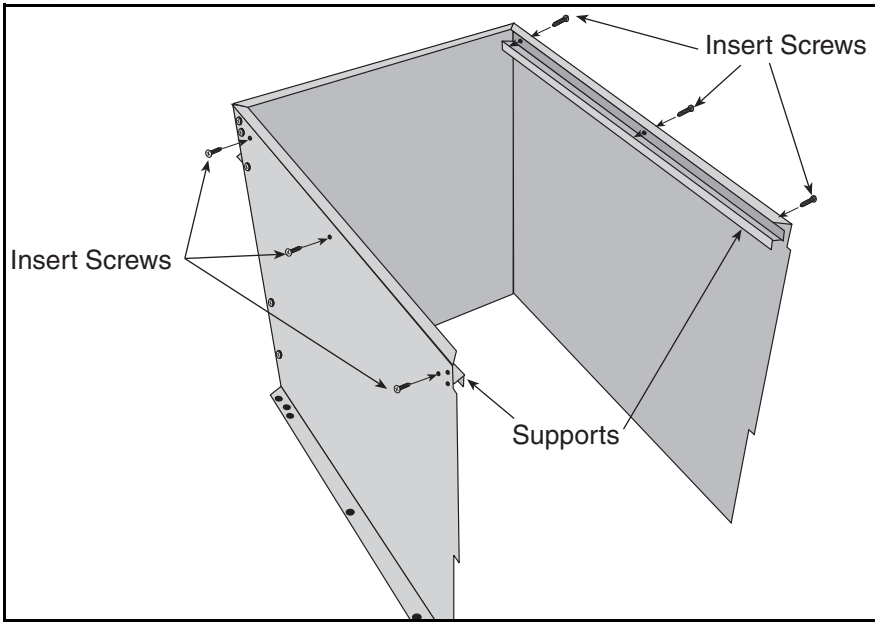
Description	Part Number	Filter Section Kit with Disposable Filters 77080.301 [W] Quantity	Filter Section Kit with Permanent Filters 77081.301 [W] Quantity
Disposable Polyester Filters 20" x 40" x 1"	23629	4	N/A
Permanent Filters 20" x 20" x 1"	20628	N/A	8
Access Cover	77401.002 [W]	1	1
Header Panel	77402.002 [W]	1	1
Right Panel	77403.001[W]	1	1
Left Panel	77403.002 [W]	1	1
Channel	77404.002	3	3
Support	77405.002	2	2
End Panel	77406.002 [W]	1	1
Stiffener	77407.002 [W]	1	1
TEK Screws	13404	38	38
Nut ¼"-20 Speed Grip C7988-1420	20499	4	4
Bolt ¼"-20 x ¾" HHCS	20504	4	4
¼" Flat Washer	20503	4	4

Step 11.1.1



Attach left panel (P/N 77403.002[W]) and right panel (P/N 77403.001[W]) to the end plate (P/N 77406.002[W]) outside mounting flanges. Fasten together with 6 TEK screws (P/N 13404) on each side as shown.

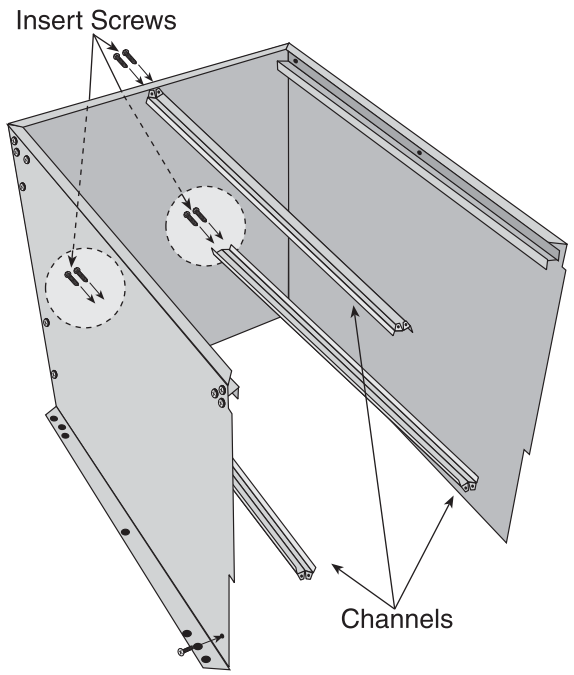
Step 11.1.2



Make sure that the bottom flanges are facing out.

Attach supports (P/N 77405.002) to top inside of the left and right panels, making sure that the channel portion is facing down into the filter section.

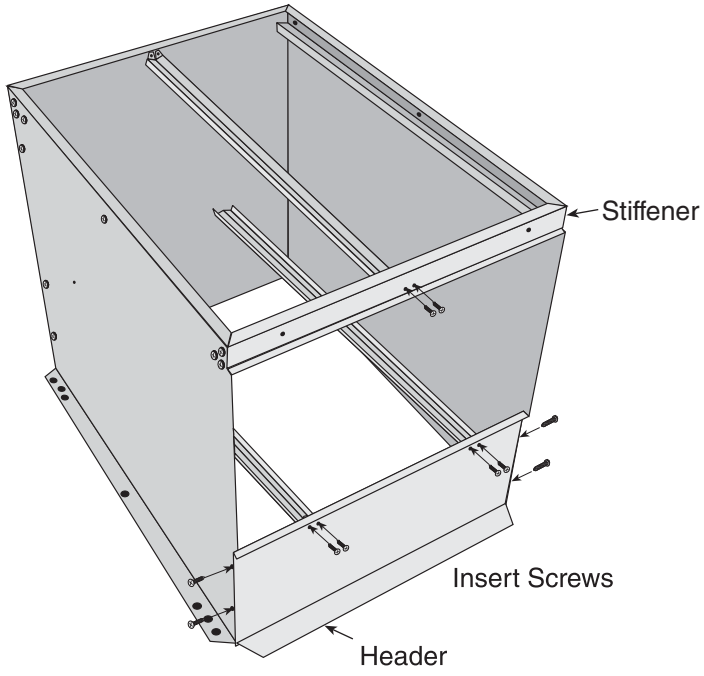
Step 11.1.3



Attach channels (P/N 77404.002) to end plate. Make sure top channel is facing down and bottom channels are facing up.

NOTE: Channels "open" to the inside of the filter box.

Step 11.1.4



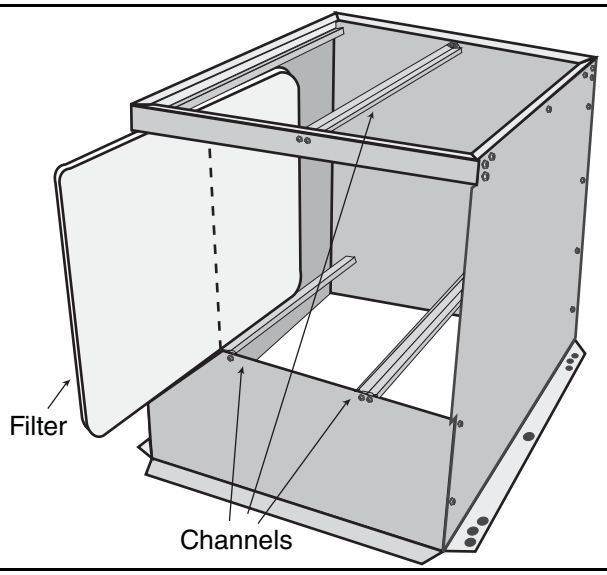
Attach header (P/N 77402.002[W]) in between the lower portion of the left and right side panels.

Attach stiffener (P/N 77407.002[W]) in between top portion of left-hand and right-hand side panels.

Attach loose end of upper filter channel to stiffener; attach loose end of lower filter channels to header piece.

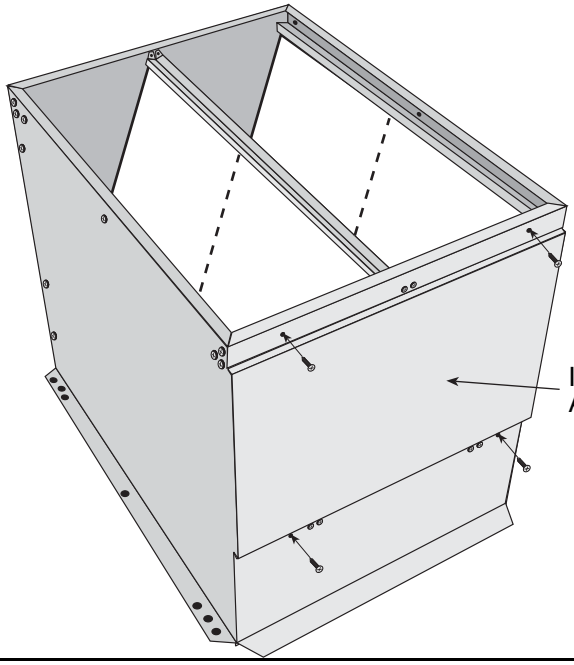
NOTE: For easier installation, the filter section may be mounted to the air handler at this point, prior to the addition of filters and access door. Refer to *Page 46, Figure 11.4* for installation instructions.

Step 11.1.5



Slide filters (P/N 23629 or P/N 20628) into channels.

Step 11.1.6



Install cage nuts into each of the four corresponding square holes (two in stiffener, two in header panel) with the cages on the inside of the filter section.

Install insulated access cover (P/N 77401.002[W]) and secure with four ¼-20 screws (P/N 20499), ¼-20 bolts (P/N 20504) and ¼" washers (P/N 20503).

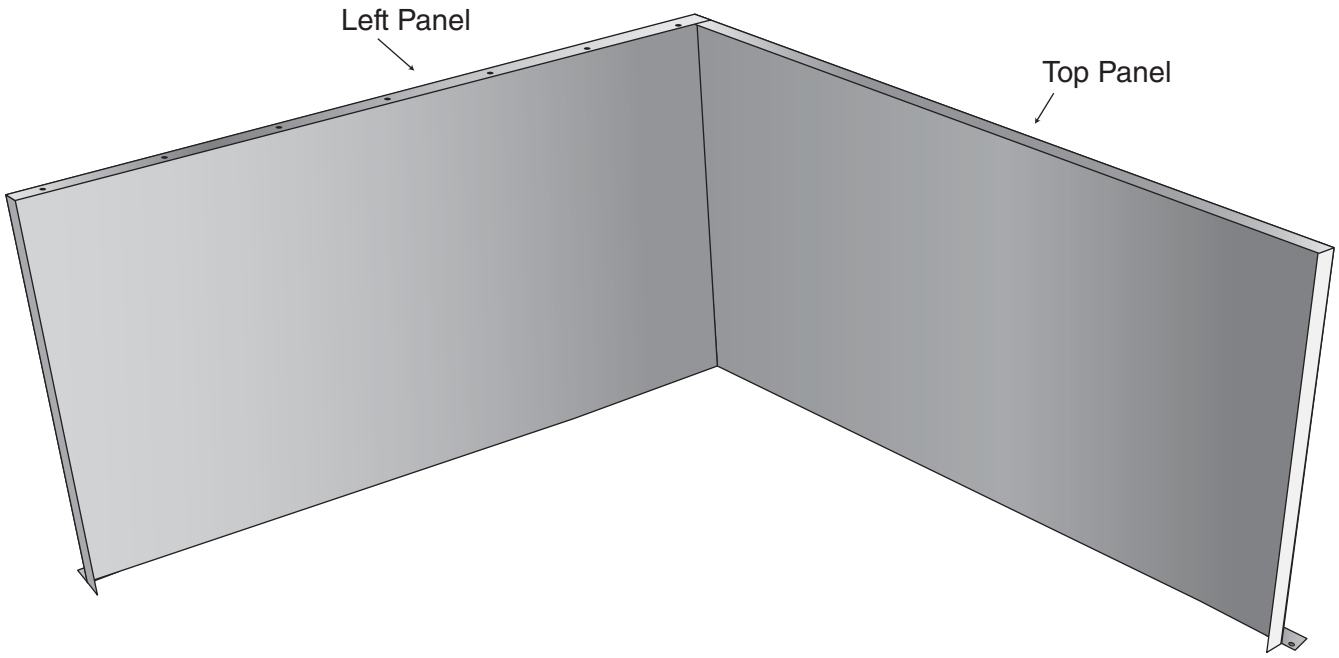
11.2 Filter Section Assembly (B-2000 and B-3000)

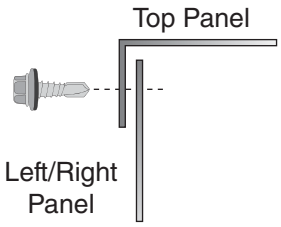
B-2000 Filter Section			
Description	**Part Number**	**Permanent Filters 13205022 (Galvanized) 13205023 (Painted White) Quantity**	**Disposable Filters 13205020 (Galvanized) 13205021 (Painted White) Quantity**
Access Door	13205025	1	1
Right Panel	13205026	1	1
Left Panel	13205028	1	1
Top Panel	13205029	1	1
Bottom Panel	13205027	1	1
Filter Rail	13205030	5	5
Side Filter Rail	13205031	2	2
Screw TEK3 #12 x ¾" Washer HD	13404	64	64
Nut ¼"-20 Speed Grip C7988-1420	20499	3	3
Hinge Butt 3 x 3 Zinc	20500	2	2
¼" Flat Washer	20503	3	3
Bolt ¼"-20 x ¾" HHCS	20504	3	3
Bolt Retainer Pushnut 1/4	20505	3	3
3/8" Flatwasher	20515	14	14
3/8"-16 x 1 Bolt Hex Grade 5	20517	14	14
10-24 KEPS Nut	20698	12	12
Permanent Filter 20" x 25" x 1"	20629	12	N/A
Disposable Polyester Filter 20" x 50" x 1"	23628	N/A	6
Bolt 10-24 x ¾" HMS	26999	6	6
10-24 x ½" HMS Bolt	27000	6	6
Fastener Rivnut 3/8"-16	91120106	14	14
Spacer Hinge Filter	13205032	8	8
Gasket Door Filter	13205035	11	11

B-3000 Filter Section			
Description	**Part Number**	**Permanent Filters 13305022 (Galvanized) 13305023 (Painted White) Quantity**	**Disposable Filters 13305020 (Galvanized) 13305021 (Painted White) Quantity**
Access Door	13305025	1	1
Right Panel	13305026	1	1
Left Panel	13305028	1	1
Top Panel	13305029	1	1
Bottom Panel	13305027	1	1
Filter Rail	13305030	7	7
Side Filter Rail	13305031	2	2
Screw TEK3 #12 x ¾" Washer HD	13404	86	86
Nut ¼"-20 Speed Grip C7988-1420	20499	3	3
Hinge Butt 3 x 3 Zinc	20500	2	2
¼" Flat Washer	20503	3	3
Bolt ¼"-20 x ¾" HHCS	20504	3	3
Bolt Retainer Pushnut 1/4	20505	3	3
3/8" Flatwasher	20515	14	14
3/8"-16 x 1" Bolt Hex Grade 5	20517	14	14
10-24 KEPS Nut	20698	12	12
Permanent Filter 20" x 20" x 1"	20628	16	N/A
Permanent Filter 20" x 25" x 1"	20629	8	N/A
Disposable Polyester Filter 20" x 60" x 1"	23621	N/A	8
Bolt 10-24 x ¾" HMS	26999	6	6
10-24 x ½" HMS Bolt	27000	6	6
Fastener Rivnut 3/8"-16	91120106	14	14
Spacer Hinge Filter	13205032	8	8
Gasket Door Filter	13205035	12	12

Note: In the instructions, an "X" in a part number indicates a digit that changes based on model. Replace the "X" with a "2" for model B-2000; replace the "X" with a "3" for model B-3000. For further clarification, see the individual table of components for each assembly at the begining of the instructions.

Step 11.2.1



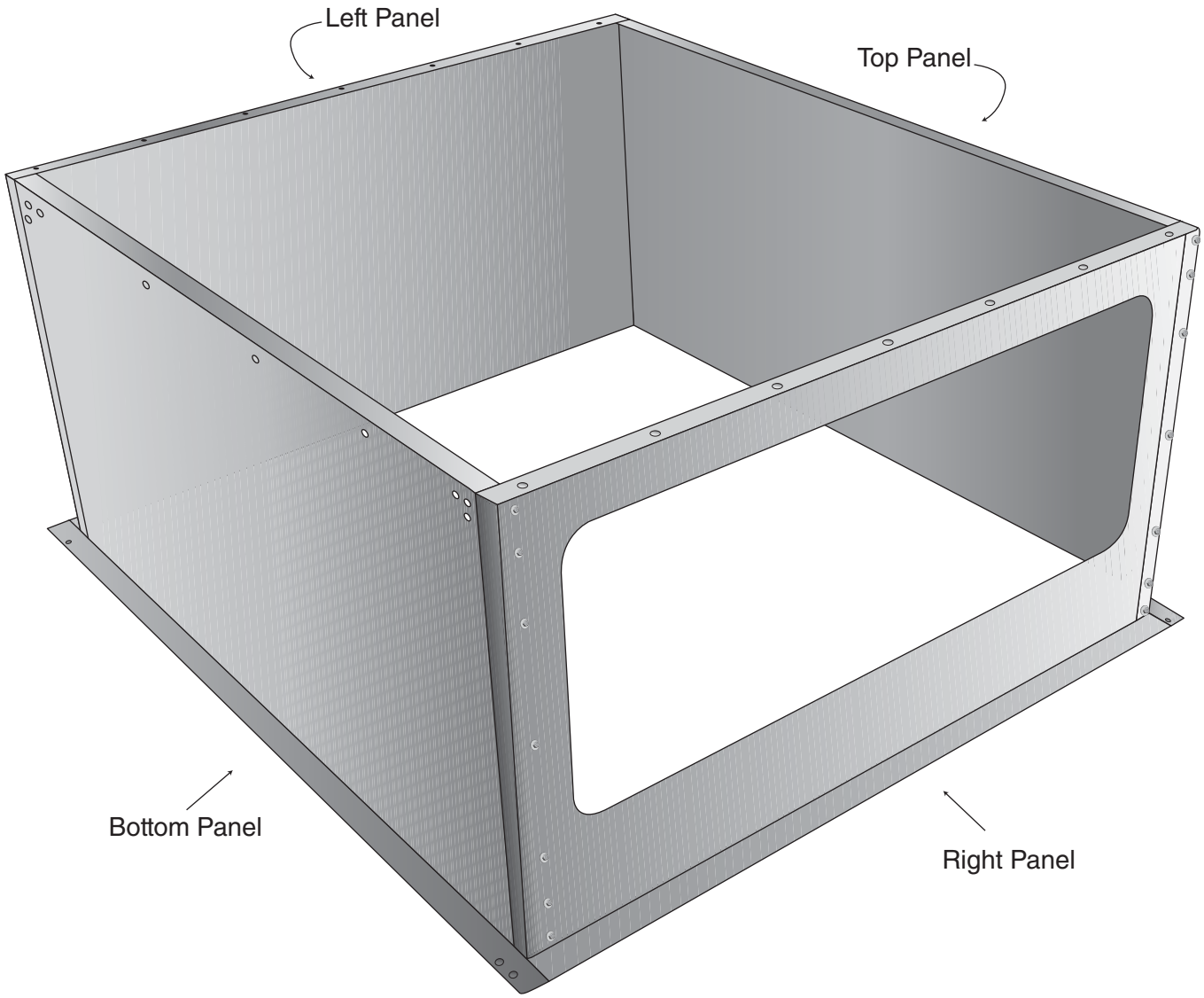


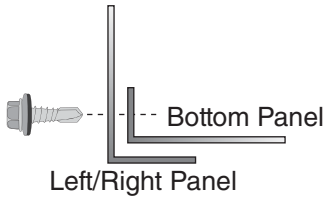
For Model B-2000: On a flat, clean and dry surface, attach the top (P/N 13205029) and left (P/N 13205028) panels of the filter section using five TEK self-tapping screws (P/N 13404).

For Model B-3000: On a flat, clean and dry surface, attach the top (P/N 13305029) and left (P/N 13305028) panels of the filter section using seven TEK self-tapping screws (P/N 13404).

NOTE: Top panel overlaps the side panel for either model. Ensure that the larger flange on each panel is on the bottom facing outward.

Step 11.2.2



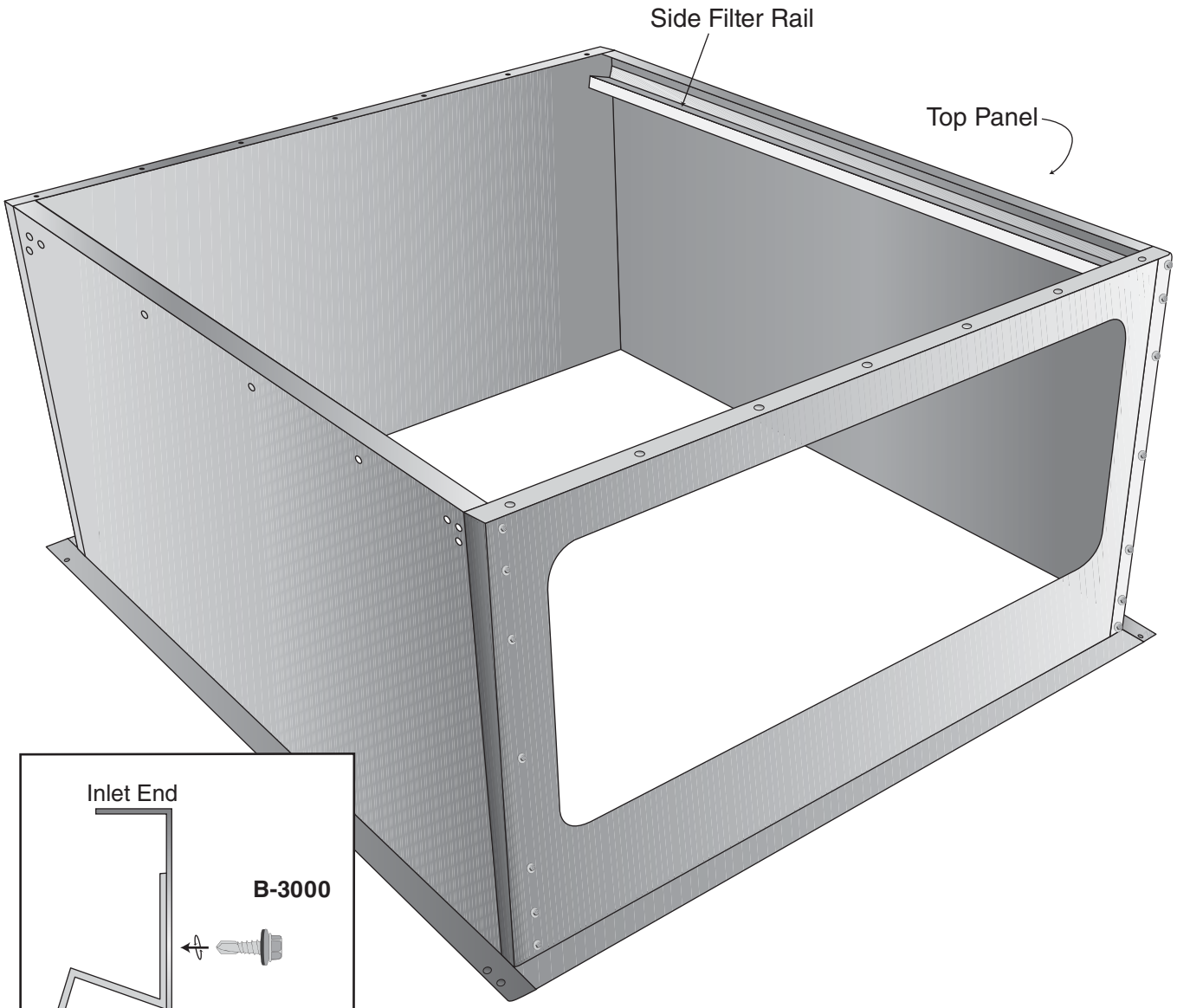


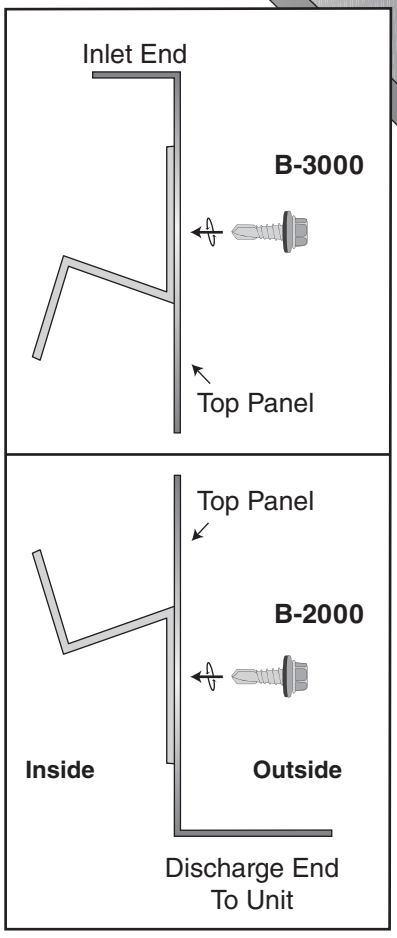
For Model B-2000: Attach the bottom panel (P/N 13205027) with five TEK self-tapping screws (P/N 13404). Attach the right panel (P/N 13205026) with five TEK self-tapping screws (P/N 13404) on each side.

For Model B-3000: Attach the bottom panel (P/N 13305027) with seven TEK self-tapping screws (P/N 13404). Attach the right panel (P/N 13305026) with seven TEK self-tapping screws (P/N 13404) on each side.

NOTE: Side panels overlap the bottom panel on either model. Ensure that the larger flange on each panel is on the bottom facing outward.

Step 11.2.3

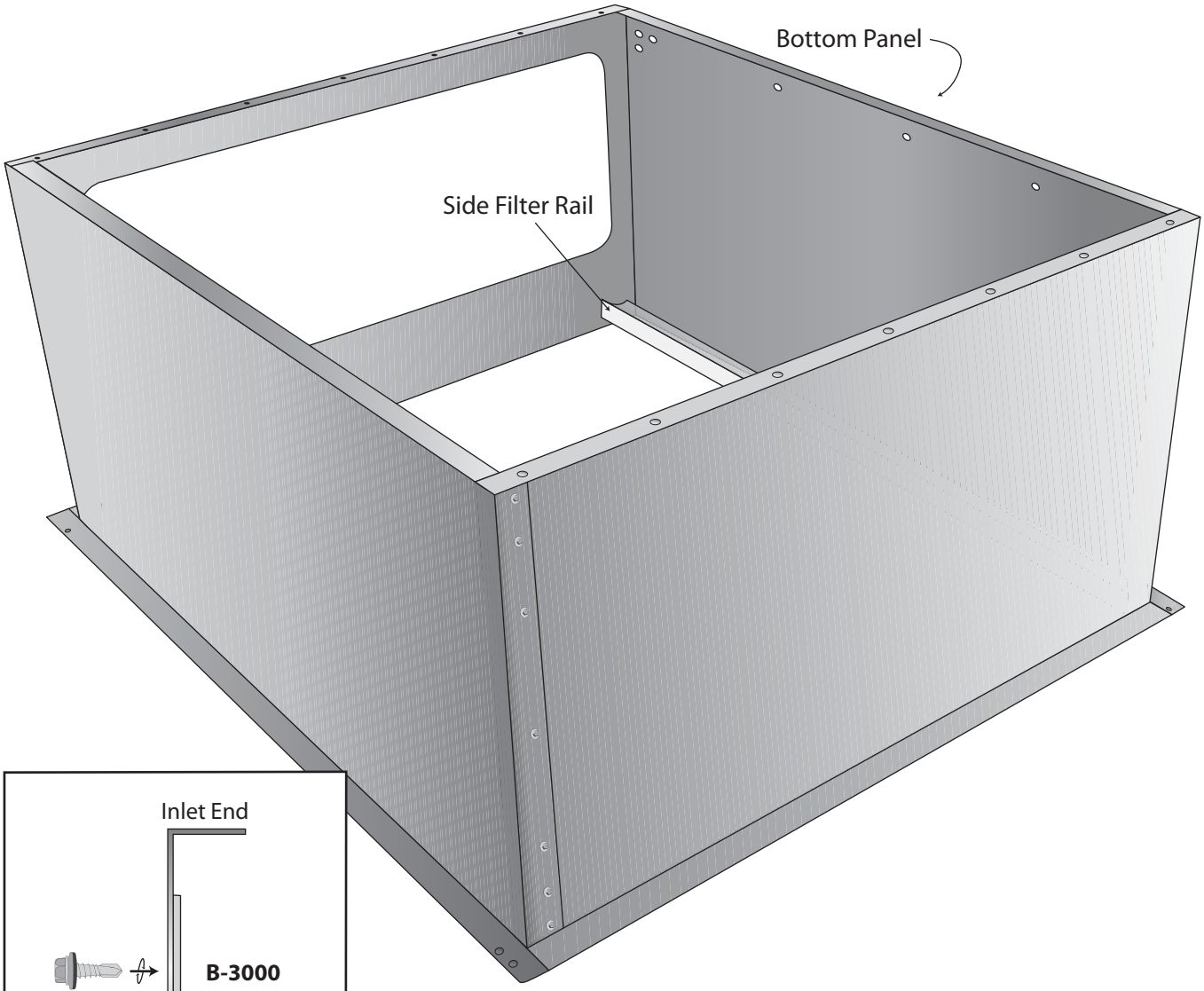


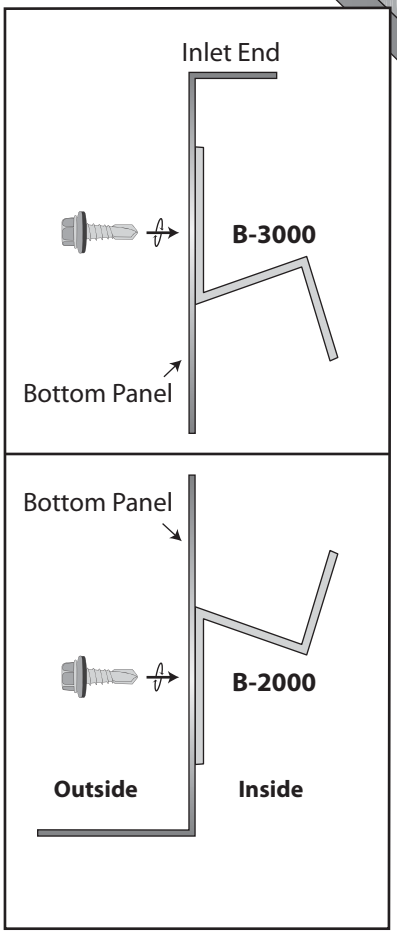


For Model B-2000: Attach the side filter rail (P/N 13205031) to the top panel with five TEK self-tapping screws (P/N 13404). Line up filter rail holes with provided holes near the discharge end of the filter section panel.

For Model B-3000: Attach the side filter rail (P/N 13305031) to the top panel with six TEK self-tapping screws (P/N 13404). Line up with provided holes near the inlet end of the filter section.

Step 11.2.4

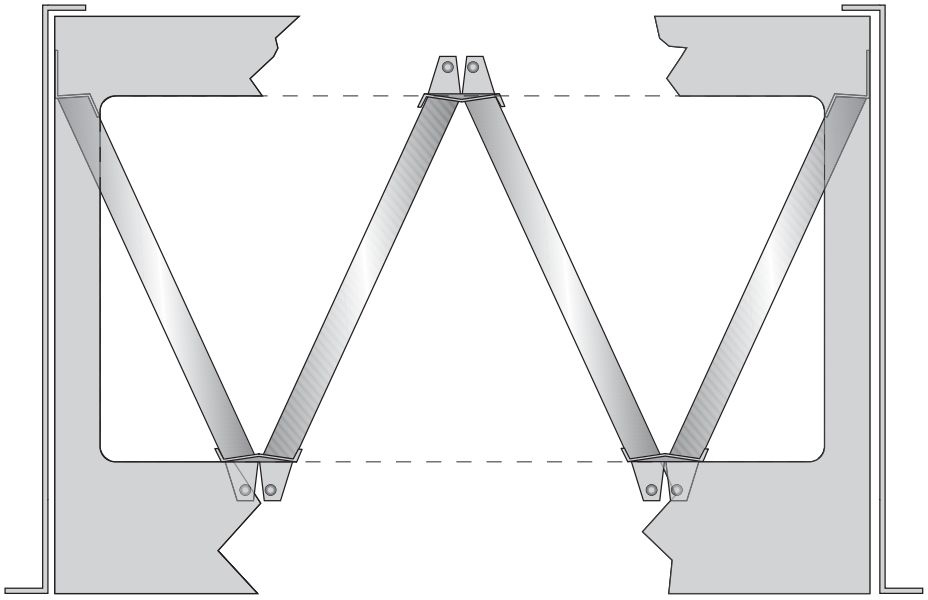




For Model B-2000: Attach the side filter rail (P/N 13205031) to the bottom panel with five TEK self-tapping screws (P/N 13404). Line up filter rail holes with provided holes near the discharge end of the filter section panel.

For Model B-3000: Attach the side filter rail (P/N 13205031) to the bottom panel with seven TEK self-tapping screws (P/N 13404). Line up with provided holes near the inlet end of the filter section.

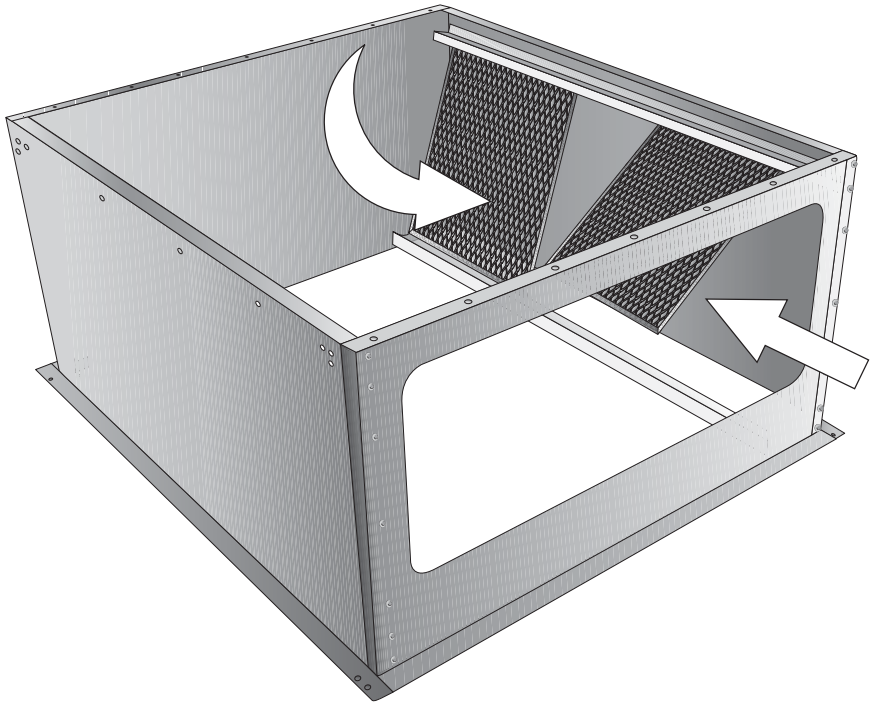
Step 11.2.5



Attach the remaining filter rails (P/N 13X05030) with four TEK self-tapping screws (P/N 13404), two on each side. Ensure that the rails face into the filter section.

NOTE: For easier installation, the filter section may be mounted to the air handler at this point, prior to the addition of filters and access door. Refer to *Page 46, Section 11.4* for installation instructions.

Step 11.2.6



Load filters into the filter section. Check that each filter in in the proper orientation.

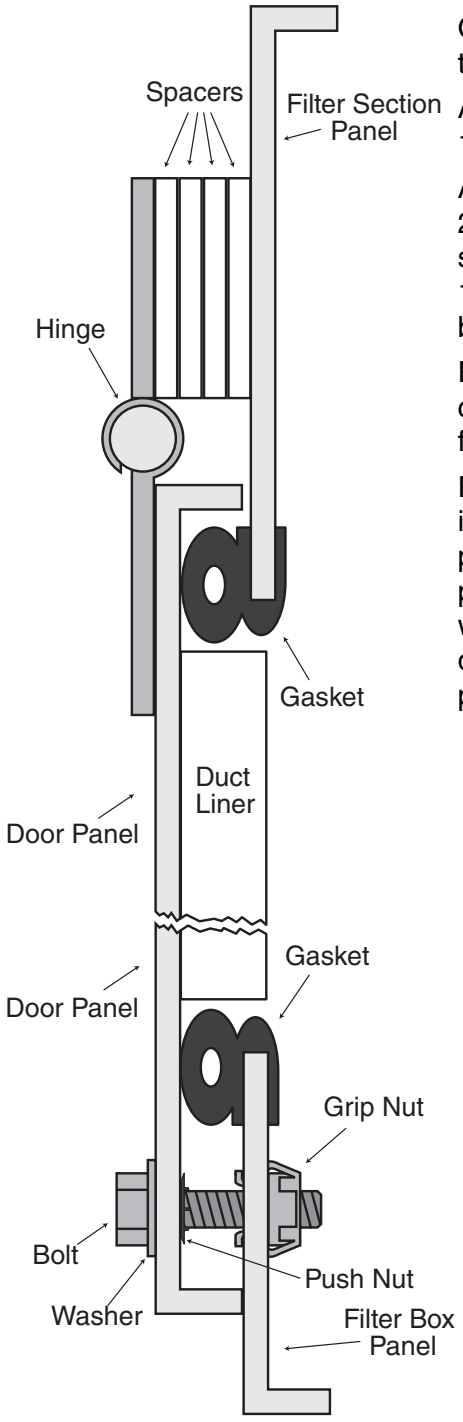
For permanent filters: Verify the arrow on the side of the filter points in the direction of the airflow.

For disposable filters: Verify the white side is facing the inlet and the blue side is facing the discharge end.

The end rows of filters need to be installed first.

NOTE: When the filter section is installed on the air handler, the top of one row of filters will support the bottom of the above row.

Step 11.2.7



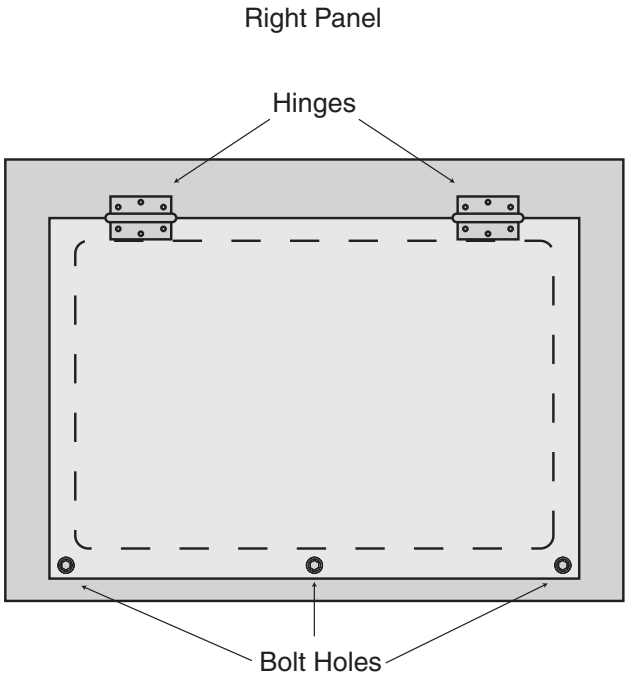
On right panel, apply provided gasket material (P/N 13205032) to the filter access opening.

Attach filter access door (P/N 13X05025) with two hinges (P/N 13205032).

Attach the hinges to the door using three 10-24 x 1/2" bolts (P/N 27000) and 10-24 nuts (P/N 20698). Attach the hinge to the filter section right panel using three 10-24 x 3/4" bolts (P/N 26999) and 10-24 nuts (P/N 20698). Use four hinge spacers (P/N 13205032) between the hinge and the right panel to keep the hinge aligned.

Press the ¼-20 grip-nuts (P/N 20505) into each of the three square cut outs in the filter section right panel on the opposite side of the filter access opening from the hinges.

Place a ¼" washer (P/N 20503) on a ¼-20 bolt (P/N 20504) and insert it into one of the three bolt holes on the door panel. Place a push-nut (P/N 20505) on to the bolt from the inside of the door panel to keep the bolt from being separated from the door panel when it is open. Repeat for the other two bolt holes. Secure the door in the closed position by threading the three bolts in the door panel to the grip-nuts on the filter section right panel.



11.3 Filter Section Support Assembly

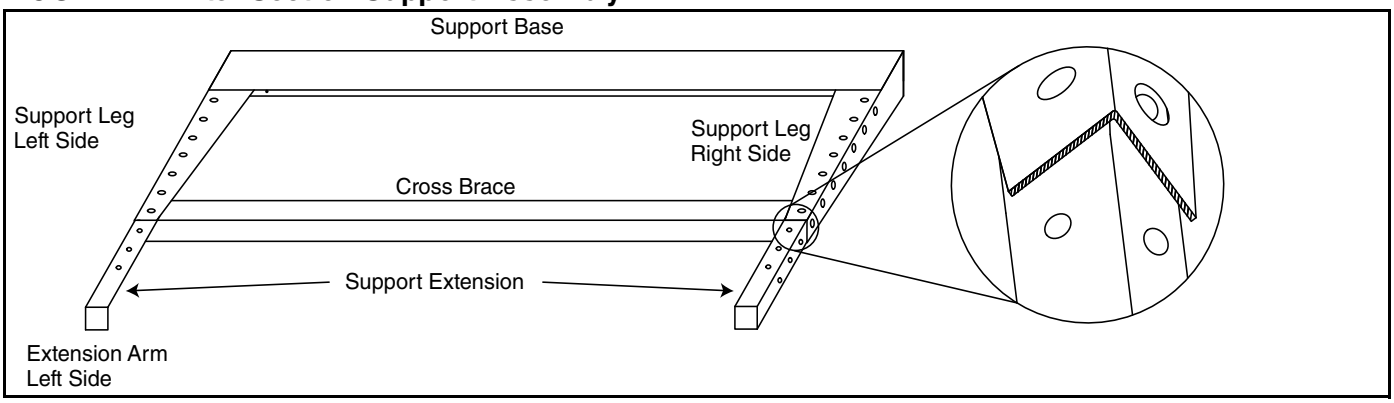
The filter section support assembly is used to add additional support to the air handler accessories that are not supported by the roof curb in a horizontal configuration. For Models B-650 - B-3000, when the air handler has both a filter section and an inlet hood, a filter section support assembly or its equivalent must be used. For Models B-4000 and B-5000 when a filter section is supplied, the support described on *Page 45, Section 11.3.2* or its equivalent must be used.

Description	Part Number	P/N 77412001 B-650 and B-1000 Quantity	P/N 77412002 B-2000 Quantity	P/N 77412003 B-3000 Quantity
Filter Box Support Base B-650 and B-1000	77408001	1		
Filter Box Support Base B-2000	77408002		1	
Filter Box Support Base B-3000	77408003			1
Filter Box Support Leg LS B-650 - B-3000	77409001	1	1	1
Filter Box Support Leg RS B-650 - B-3000	77409002	1	1	1
Filter Box Support Ext LS,RS B-650 - B-3000	77410001	2	2	2
Filter Box Support Brace B-650 and B-1000	77411002	1		
Filter Box Support Brace B-2000	77411002		1	
Filter Box Support Brace B-3000	77411003			1
Scr Tek3 #12x3/4 Washer	13404	11	14	16
1/4-20 x 1/2 Bolt Hex Head Cap Screw	20483	8	8	8
1/4-20 Nut Flange	20630	8	8	8
1/4 Flat Washer	20503	8	8	8

11.3.1 Filter Section Support Assembly Installation (B-650 - B-3000)

It is best to assemble the support base and support arms to the filter section prior to attaching the filter section to the air handler but can also be assembled to a previously installed filter section. Refer to *Page 44, Figure 27*.

FIGURE 27: Filter Section Support Assembly



Step 1: Place the support base (P/N 7740800X) up to the bottom of the filter section towards the inlet end and line up the pre-drilled holes. Use TEK self-tapping screws (P/N 13404) in the middle of the support base (P/N 7740800X) to secure the support base in place.

Step 2: Line up the pre-drilled holes at the ends of the support base, the filter section and the support legs (P/N 7740900X) and attach the legs to the bottom of the filter section through the support base with TEK self-tapping screws (P/N 13404). Install TEK self-tapping screws (P/N 13404) at each of the remaining hole locations in the support base.

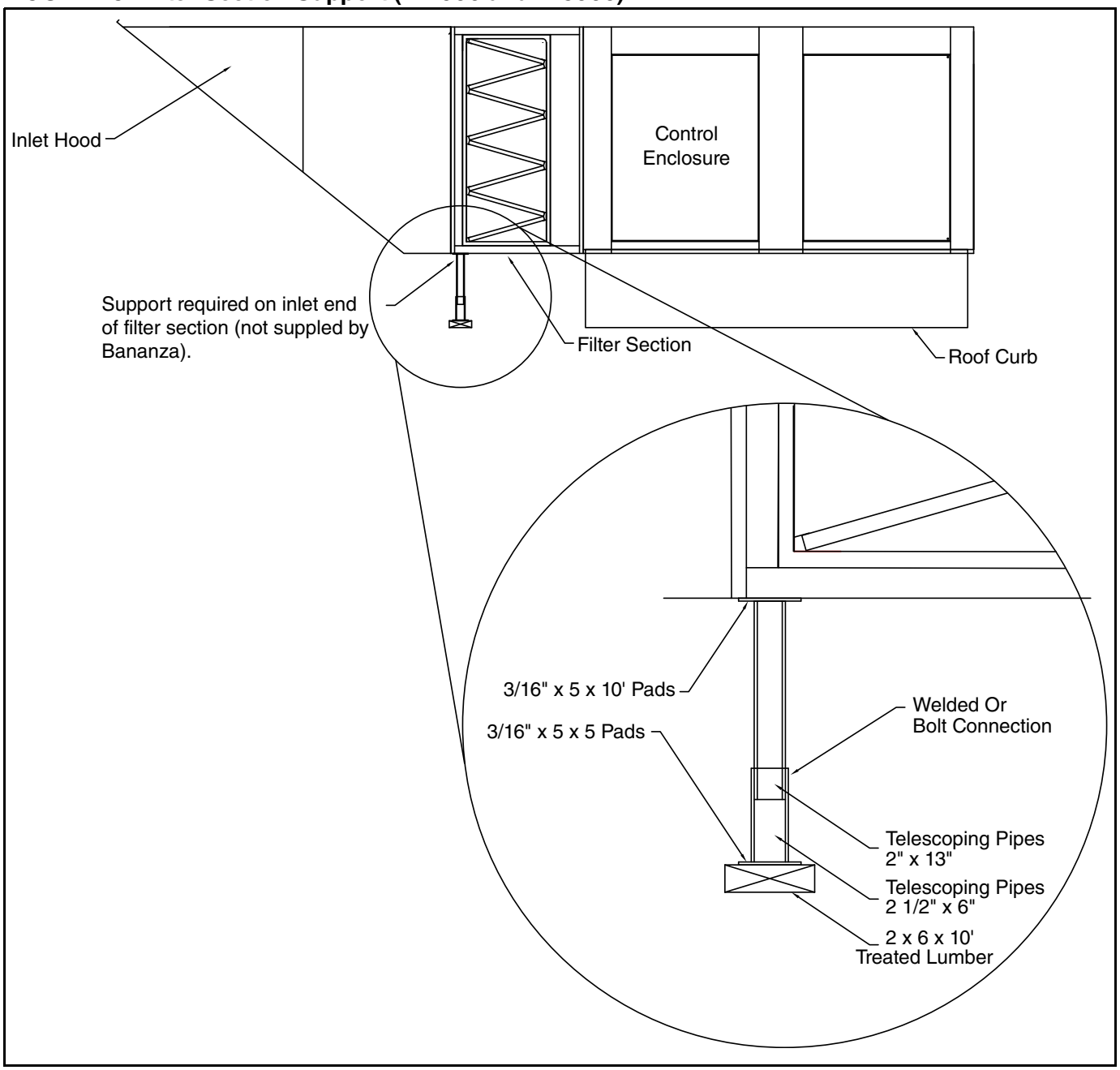
Step 3: Mount the filter section to the air handler as described on *Page 46, Section 11.4*.

Step 4: Line up the support extension (P/N 77410001) with the left support leg (P/N 77409001) and select the appropriate height alignment. Attach the support extension and left support legs and support brace (P/N 774110X) at the lowest overlap position with one ¼-20 bolt (P/N 20483) and flange nut (P/N 220630) on the front surface. Install a second ¼-20 bolt (P/N 20483) and flange nut (P/N 220630) directly above the first, securing all three parts together.
Repeat step 4 on the right side of the support assembly.

11.3.2 Filter Section Support Assembly (B-4000 and B-5000)

For Models B-4000 and B-5000, the filter section support assembly that is used is a field fabricated telescoping pipe assembly that rests on a treated piece of lumber. Refer to *Page 45, Figure 28* for fabrication details.

FIGURE 28: Filter Section Support (B-4000 and B-5000)


Inlet Hood
Control Enclosure
Support required on inlet end of filter section (not suppled by Bananza).
Filter Section
Roof Curb
3/16" x 5 x 10' Pads
3/16" x 5 x 5 Pads
Welded Or Bolt Connection
Telescoping Pipes 2" x 13"
Telescoping Pipes 2 1/2" x 6"
2 x 6 x 10' Treated Lumber

11.4 Filter Section Installation - Horizontal Air Handlers

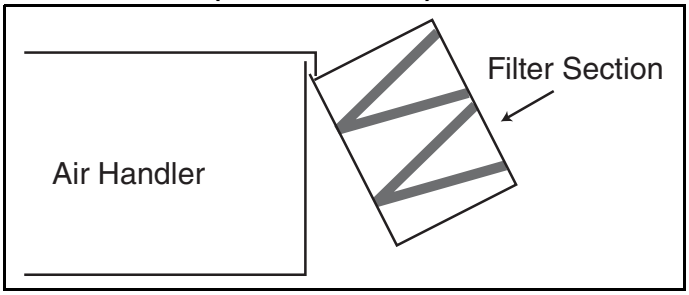
11.4.1 Filter Section Installation (B-350)

For installation directly onto the inlet of the air handler, remove the hardware on the inlet surface of the air handler that would prevent the filter section from being mated to the inlet of the air handler. Use the provided shims (one bottom and two sides) to reduce the size of the gap between the air handler and the filter section. Re-install the hardware (that was removed) through the filter section and the shims to mate the air handler to the filter section. Caulk the sides, roof and bottom seams between the filter section and air handler. Apply 3" zip tape (provided by others) over the roof seam. Install the filters and attach the filter access door.

11.4.2 Filter Section Installation (B-650 - B-3000)

For installation directly onto the inlet of the air handler, foam tape (provided by others) must be applied to the air handler sides and bottom. To place the filter section, the top flange of the filter section will slide up under the top drip edge of the air handler. Refer to *Page 46, Figure 29*. All hardware in the top drip edge will need to be removed prior to placing the filter section on the air handler. Attach the sides of the filter section to the riv-nuts installed in the inlet of the air handler with the supplied hardware. Re-install the hardware from the top drip edge of the air handler through the top drip edge and top flange of the filter section. Additional TEK screws may be used along the bottom flange of the filter section to seal the bottom seam. Caulk the side and bottom seams between the filter section and air handler. If the filter section was installed prior to completing the filter section assembly, return to the filter section assembly instructions to complete the assembly. *See Page 36, Figure 11.1.5* for Models B-350 - B-1000 or *Page 42, Figure 11.2.6* for Models B-2000 and B-3000.

FIGURE 29: Filter Section Installation on Horizontal Air Handler (B-650 - B-3000)



11.4.3 Filter Section Installation (B-4000 and B-4000)

For installation directly onto the inlet of the air handler, install the provided hardware through the filter section to the riv-nuts in the air handler cabinet. Caulk the sides, roof and bottom seams between the filter section and air handler. Apply 3" zip tape over the roof seam. Install the filters and secure the filter access door in the closed position.

11.5 Filter Section Installation - Upright Air Handlers

11.5.1 Filter Section Installation (B-350)

For installation directly onto the inlet of the air handler, remove the hardware on the inlet surface of the air handler that would prevent the filter section from being mated to the inlet of the air handler. Use the provided shims (one bottom and two sides) to reduce the size of the gap between the air handler and the filter section. Re-install the hardware (that was removed) through the filter section and the shims to mate the air handler to the filter section. Caulk the sides, roof and bottom seams between the filter section and air handler. Install the filters and attach the filter access door.

11.5.2 Filter Section Installation (B-650 - B-5000)

To install a filter section on an upright air handler that is stand mounted, the filter section must be installed in the stand prior to placing the air handler (*See Page 24, Section 8* for proper stand mounting). Place the filter section so that the outward flange is on the top side. Set the filter section into the stand. Place ½" foam tape (supplied by others) along the perimeter of the top of the flange. Place the air handler in the stand per the stand mounting instructions. *See Page 24, Section 8*.

To install a filter section on an upright air handler that is leg mounted, bolt the filter section to the inlet of the air handler. Rope caulk or foam tape (supplied by others) should be used around the perimeter of the mounting surface between the air handler and the filter section. Place the air handler on the legs per the leg mounting instructions(*See Page 26, Section 9*).

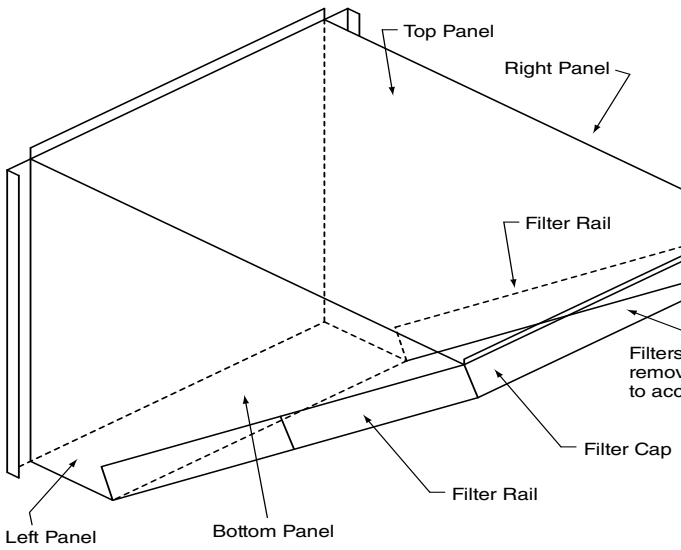
SECTION 12: INLET HOODS

⚠ WARNING			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

Inlet hoods are shipped unassembled and must be assembled prior to installation.
Part numbers ending with a "[W]" indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include a "W" at the end of the part number; to order with a white paint finish, include a "W" at the end of the part number.
NOTE: Check to be sure that all required components are present. If any are missing, contact your BANANZA® independent distributor.

12.1 Inlet Hood Assembly (B-350)

FIGURE 30: Inlet Hood Assembly (B-350)

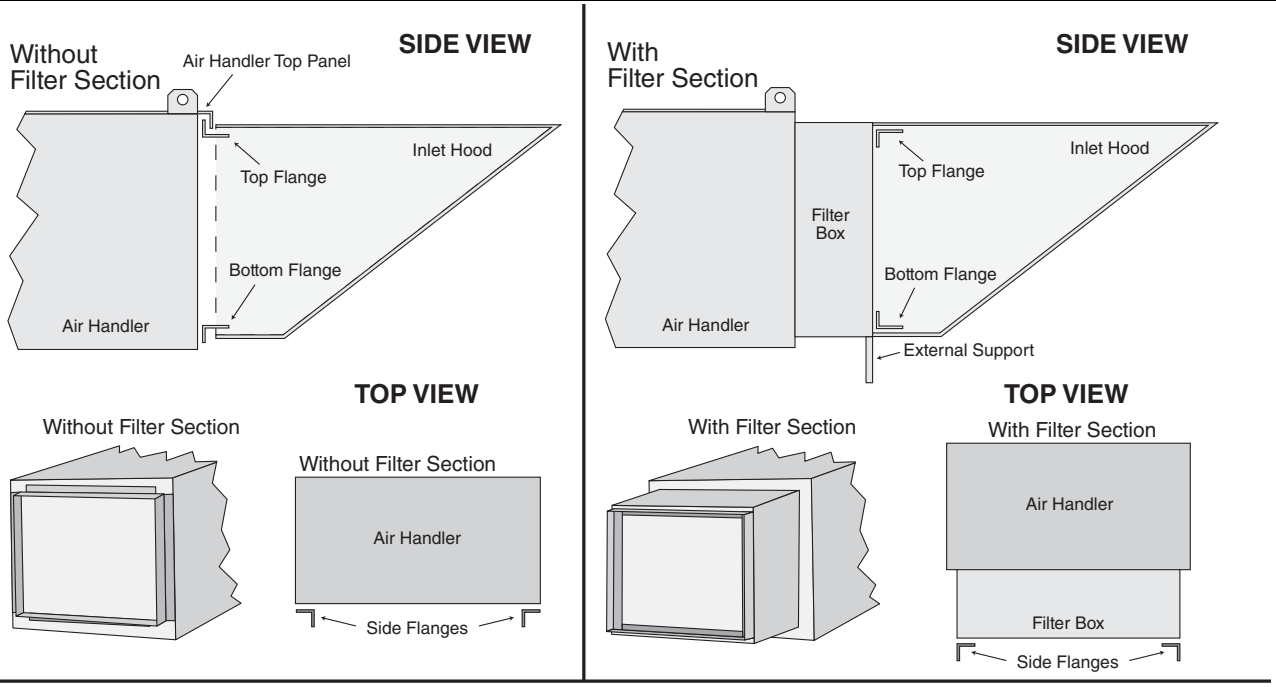


Description	Part No.	Qty.
B-350 Inlet Hood	**77030.301W**	
Top Panel	73031.002W	1
Filter Cap	73032.002W	1
Left Panel	73033.001W	1
Right Panel	73033.002W	1
Permanent Filters 20 x 25 x 2	22628	2
10-24 x 3/4" Hex-Head, Cap-Screw Bolt	21699	18
10-24 Keps Nut	20698	18
Screw TEK3 #12 X 3/4 Washer HD	13404	8
Filter Channel	73035.002	2
Bottom Guide	73036.002	1
Bottom Panel	73034.002	1

12.2 Inlet Hood Assembly (B-650 and B-1000)

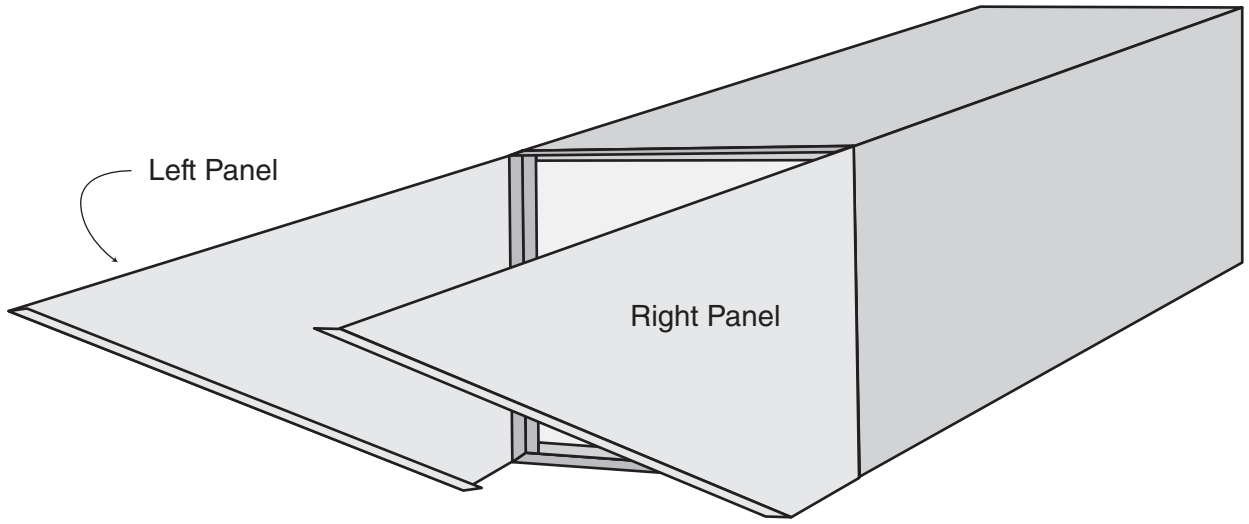
Description	Part No.	Qty.
Inlet Hood Filter Rail Assembly	13505066	2
Inlet Hood Top Inner Rail	13505068	1
Inlet Hood Bottom Rail Assembly	13505072	1
Inlet Hood Top Back Panel	13505075	1
Inlet Hood Top Front Panel	13505076	1
Inlet Hood Panel Left	13505080	1
Inlet Hood Panel Right	13505081	1
Inlet Hood Upright Mount	13505090	2
Inlet Hood Horizontal Mount	13505091	2
Inlet Hood Drip Rail	13505092	2
Screw TEK3 #12 x 3/4 Washer HD	13404	82
5/16-18 x 1 Bolt HHCS Grade 5	20507	5
5/16 Flat Washer	20529	5
5/16 Nut Flange	20509	5
Permanent Filter 20x20x1	20628	6
10-24 KEPS Nut	20698	8
A1 Snap Fastener	20900	6
10-24 x 1/2 HMS Bolt	27000	8
Fastener Rivnut 3/8-16	91120106	10
3/8 Flatwasher	20515	10
3/8-16 x 1 Bolt Hex Grade 5	20517	10
Foam Tape	92700017	14

Step 12.2.1



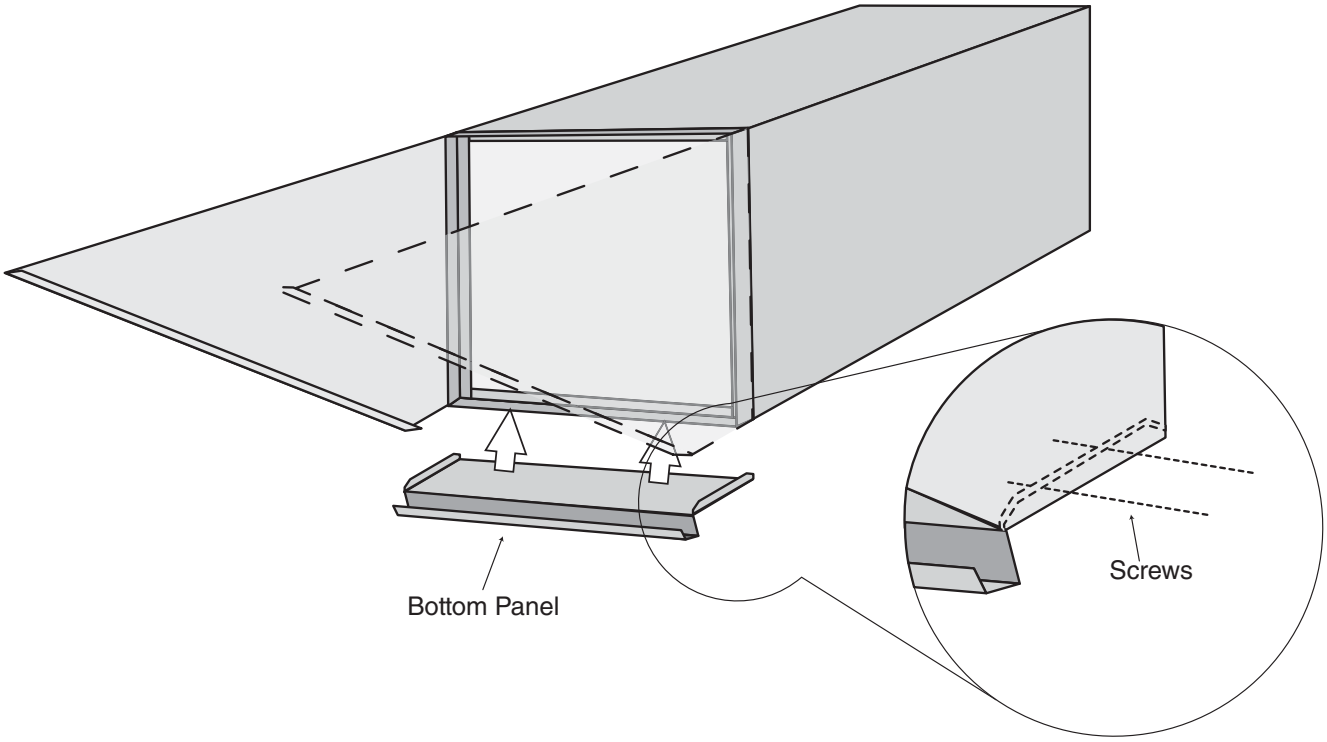
Install the attaching flanges to the inlet of the air handler. The flanges will be installed so that the angles open toward the outside of the air handler. If the air handler has a filter section, attach the filter section to the air handler first and then bolt the inlet hood mounting flanges to the inlet of the filter section with the flange angles opening toward the inside of the filter section. Side flanges (P/N 13505090) are attached with five 3/8-16 bolts (P/N 20517) and flat washers (P/N 20515) each; the receiving riv-nut (P/N 91120106) will be pre-installed on the air handler or filter section. Horizontal flanges (P/N 13505091) are attached using five TEK self-tapping screws (P/N 13404). Prior to mounting the flanges, seal the gap between the mating surfaces of the air handler/filter section and the flanges with the provided foam tape. When installing the top flange directly to an air handler without a filter section, foam tape should NOT be used. In this case, the hardware on the lip of the air handler roof panel should be removed, the flange slid under the lip and the hardware re-installed.

Step 12.2.2



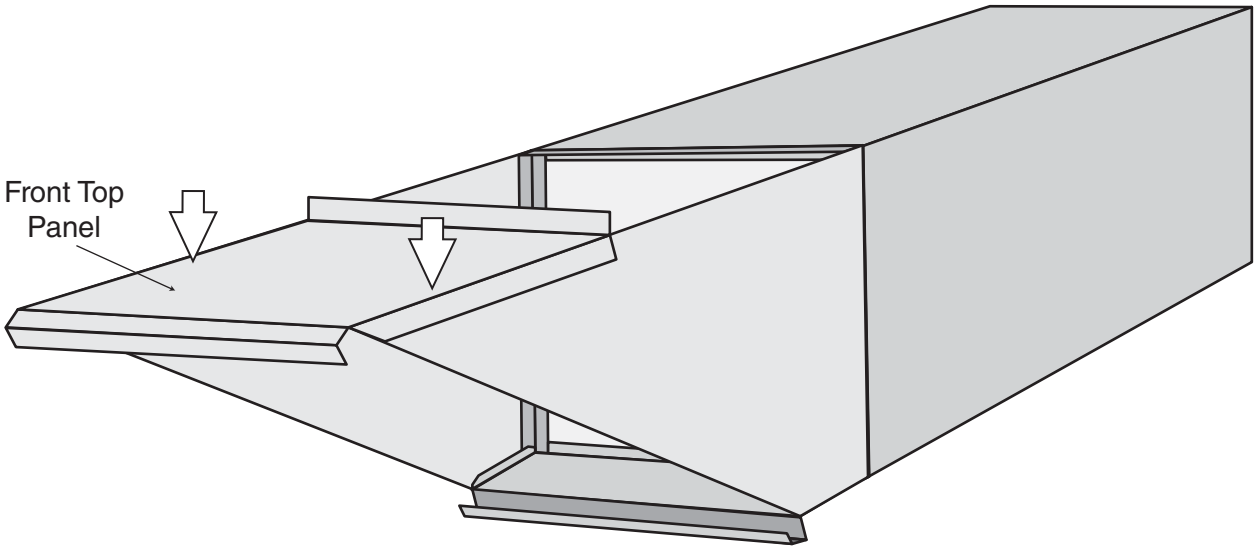
Attach a sidewall panel (left P/N 13505080 and right P/N 13505081) to each side flange of the air handler/filter section using five TEK self-tapping screws (P/N 13404). Ensure that the flanges on the panels break inward.

Step 12.2.3



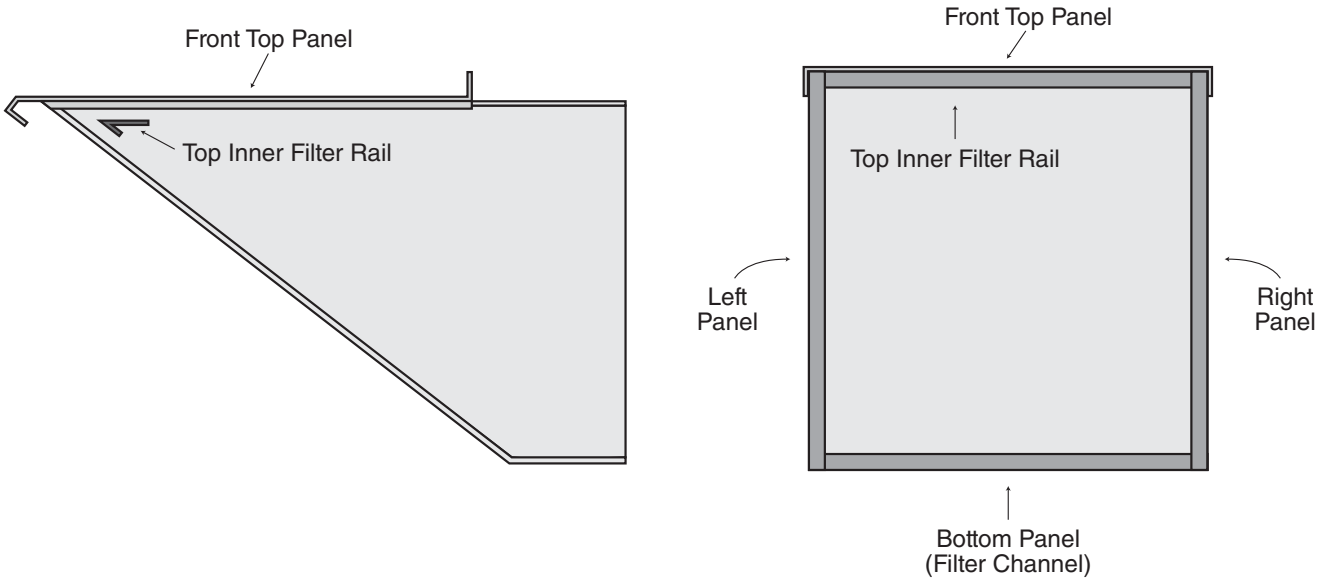
Attach the bottom panel (P/N 13505072) to the bottom attaching flange with five TEK self-tapping screws (P/N 13404) and to each side panel with two TEK self-tapping screws (P/N 13404). Ensure that the side tabs of the bottom panel are to the inside of the side panels.

Step 12.2.4



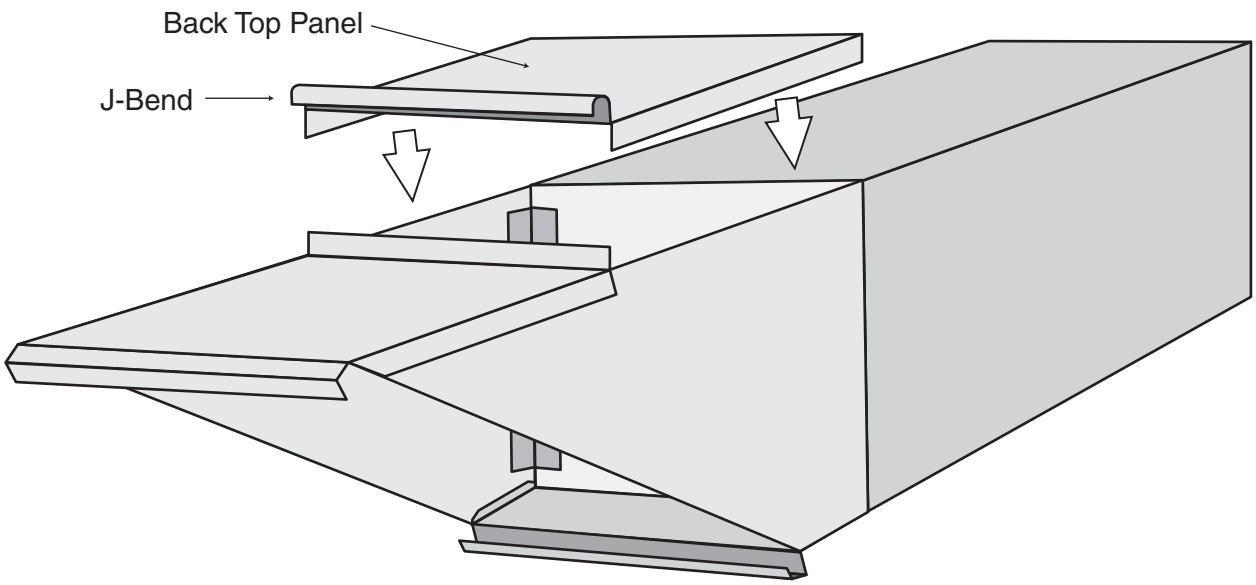
Attach front top panel (P/N 13505076) to the sidewall panels using four TEK self-tapping screws (P/N 13404) on each side. Ensure that the side tabs of the top panel are to the outside of the side panels.

Step 12.2.5



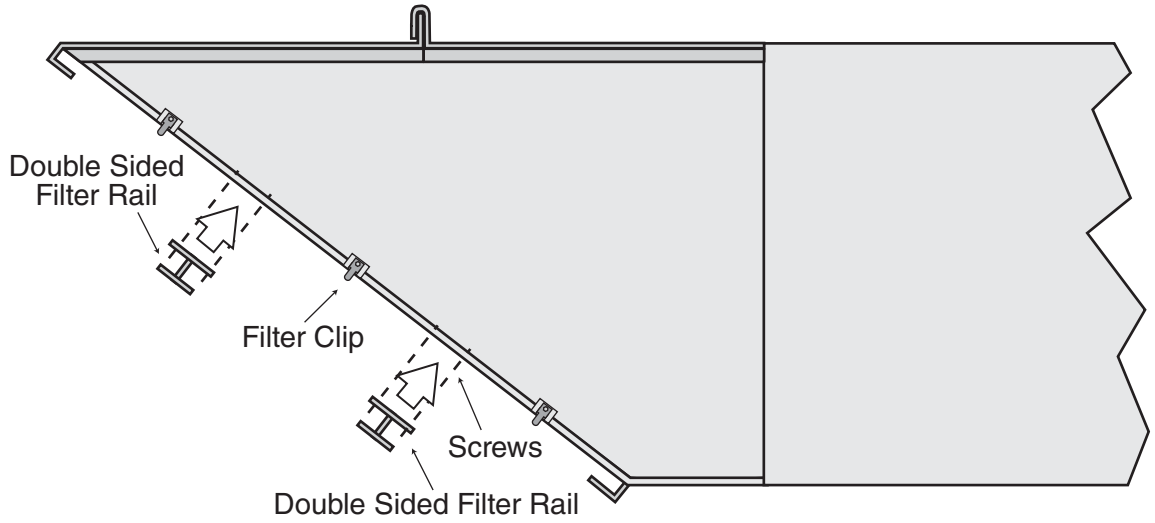
Attach the top inner filter rail (P/N 13505068) to the inside of the front top panel using four TEK self tapping screws (P/N 13404). Ensure that the rail is installed with the ends tight against the flanges of the sidewall panels and the angle opening toward the inside of the inlet hood.

Step 12.2.6



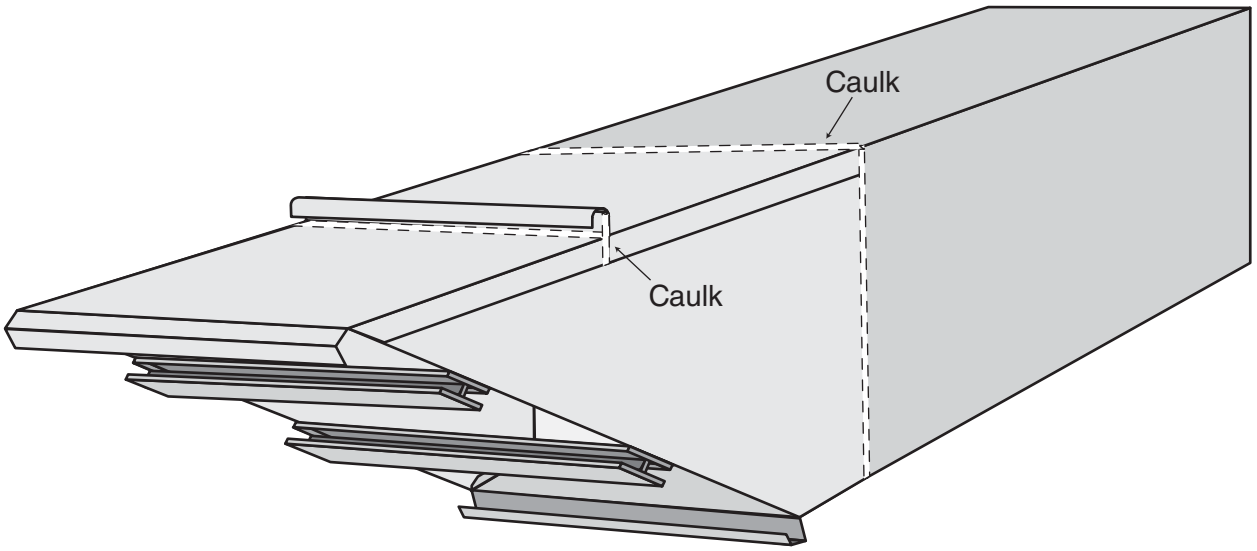
Attach back top panel (P/N 13505075) with four TEK self-tapping screws (P/N 13404) on each side, with five TEK self-tapping screws (P/N 13404) to the top attaching flange and with five 5/16-18x1 hex head cap screws (P/N 20507), 5/16 washers (P/N 20529) and 5/16 flange nuts (P/N 20509) at the J-bend joint. Ensure that the side tabs of the roof panel are to the outside of the side panels and that the J-bend interlocks with the front roof panel.

Step 12.2.7



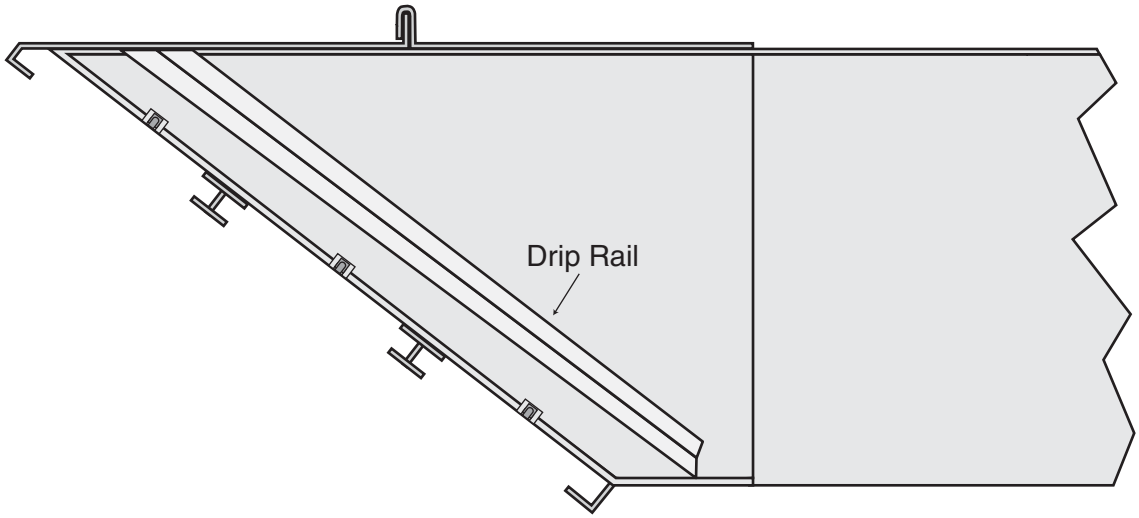
Attach the double-sided filter rails (P/N 13505066) horizontally to the face of the inlet hood using two #10-24 X ½" bolts (P/N 27000) and #10-24 nuts (P/N 20698) on each side. When attaching the filter rails, insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters. Attach the filter clips (P/N 20900) with one TEK self-tapping screw (P/N 13404) each. (First remove the washer as the washer will restrict the filter clip, making it difficult to open.)

Step 12.2.8



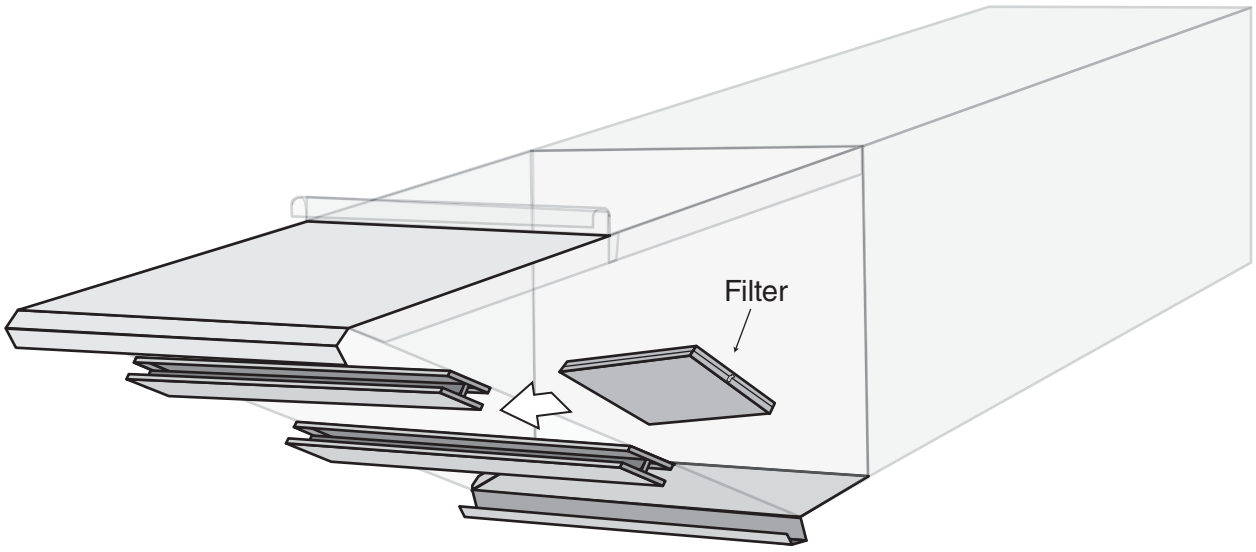
Caulk the seams between the inlet hood and the air handler/filter section and on the open sides of the J-bend that lock the roof panels together.

Step 12.2.9



Attach drip rail (P/N 13505092) to each side using five TEK self-tapping screws (P/N 13404) for each drip rail. Ensure that the drip rails are positioned above the filter clips, using the provided holes in the sidewall panels. Apply caulk to the drip rails before attaching to the side panels.

Step 12.2.10



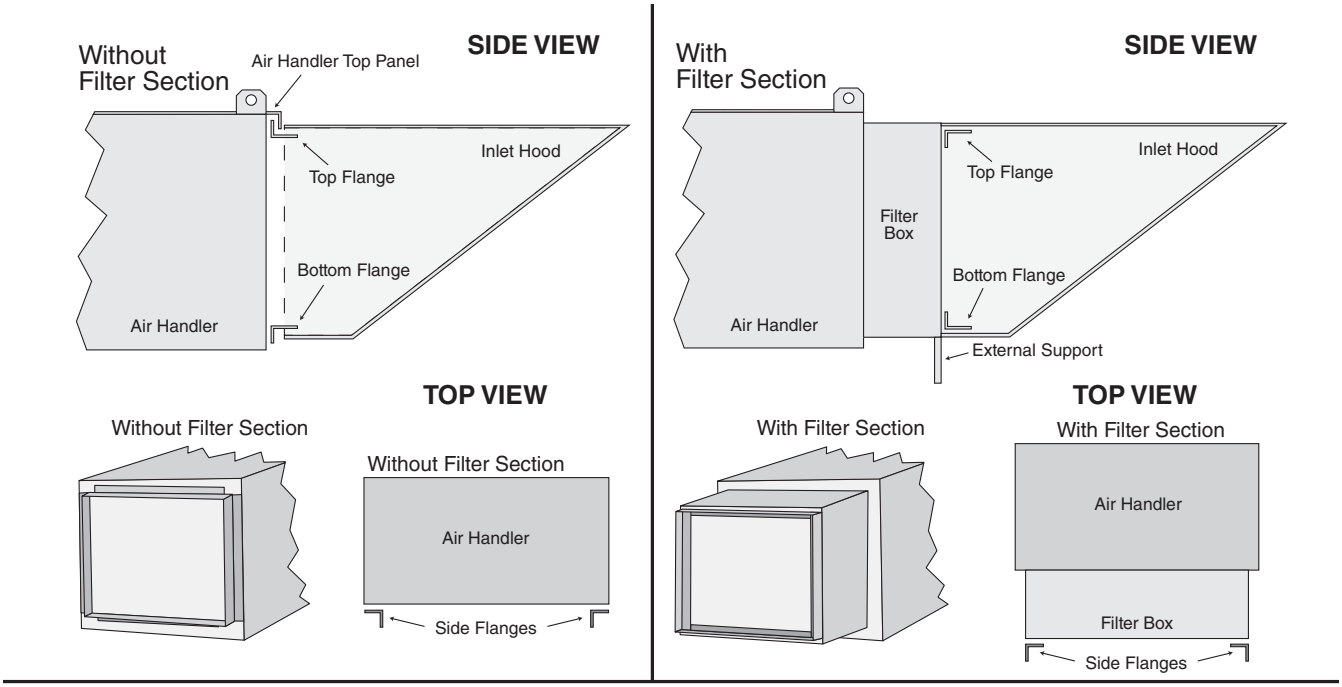
Load filters (P/N 20628) into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows should be pointing towards the air handler when installed in the proper orientation. Once filters are installed, close filter clips installed previously (*See Page 51, Step 12.2.7*) to hold filters in place.

12.3 Inlet Hood Assembly (B-2000 and B-3000)

B-2000 Inlet Hood		
13205060 (Galvanized) and 13205061 (Painted White)		
Description	**Part No.**	**Qty.**
Filter Rail Assembly	13205066	4
Top Inner Rail	13205068	1
Bottom Rail Assembly	13205072	1
Top Panel 1	13205075	1
Top Panel 2	13205076	1
Top Panel 3	13205077	1
Panel 1 Left	13205080	1
Panel 1 Right	13205081	1
Panel 2 Left	13205082	1
Panel 2 Right	13205083	1
Panel 3 Left	13205084	1
Panel 3 Right	13205085	1
Upright Mount	13205090	2
Horizontal Mount	13205091	2
Drip Rail Upper Right	13305092	1
Drip Rail Upper Left	13305093	1
Drip Rail Lower Right	13305094	1
Drip Rail Lower Left	13305095	1
Screw TEK3 #12 x ¾" Washer HD	13404	141
5/16"-18 x 1 Bolt HHCS Grade 5	20507	12
3/8" Flatwasher	20515	14
3/8"-16 x 1 Bolt Hex Grade 5	20517	14
5/16" Flat Washer	20529	12
5/16" Nut Flange	20509	12
Permanent Filter 20" x 25" x 1"	20629	10
10-24 KEPS Nut	20698	10
A1 Snap Fastener	20900	10
10-24 x ½" HMS Bolt	27000	10
Fastener Rivnut 3/8"-16	91120106	14
Foam Tape	92700017	20' (6 m)

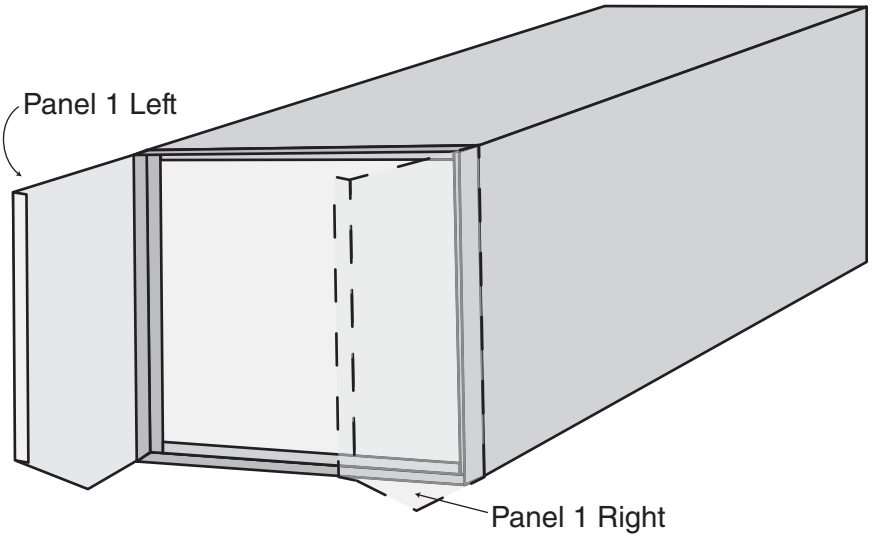
B-3000 Inlet Hood		
13305060 (Galvanized) and 13305061 (Painted White)		
Description	**Part No.**	**Qty.**
Filter Rail Assembly	13305066	4
Top Inner Rail	13305068	1
Bottom Rail Assembly	13305072	1
Top Panel 1	13305075	1
Top Panel 2	13305076	1
Top Panel 3	13305077	1
Panel 1 Left	13305080	1
Panel 1 Right	13305081	1
Panel 2 Left	13305082	1
Panel 2 Right	13305083	1
Panel 3 Left	13305084	1
Panel 3 Right	13305085	1
Upright Mount	13305090	2
Horizontal Mount	13305091	2
Drip Rail Upper Right	13305092	1
Drip Rail Upper Left	13305093	1
Drip Rail Lower Right	13305094	1
Drip Rail Lower Left	13305095	1
Screw TEK3 #12 x ¾" Washer HD	13404	150
5/16"-18 x 1 Bolt HHCS Grade 5	20507	12
3/8" Flatwasher	20515	14
3/8"-16 x 1 Bolt Hex Grade 5	20517	14
5/16" Flat Washer	20529	12
5/16" Nut Flange	20509	12
Permanent Filter 20" x 20" x 1"	20628	10
Permanent Filter 20" x 25" x 1"	20629	5
10-24 KEPS Nut	20698	10
A1 Snap Fastener	20900	10
10-24 X ½" HMS Bolt	27000	10
Fastener Rivnut 3/8"-16	91120106	14
Foam Tape	92700017	20' (6 m)

Step 12.3.1



Install the attaching flanges to the inlet of the air handler. The flanges will be installed so that the angles open toward the outside of the air handler. If the air handler has a filter section, attach the filter section to the air handler first and then bolt the inlet hood mounting flanges to the inlet of the filter section with the flange angles opening toward the inside of the filter section. Side flanges (P/N 13X05091) are attached with seven 3/8-16x1 bolts (P/N 20517) and flat washers (P/N 20515); the receiving riv-nuts (P/N 91120106) will be pre-installed on the air handler or filter section. Top and bottom flanges (P/N 13X05091) are attached using nine #12 TEK self-tapping screws (P/N 13404). Prior to mounting the flanges, seal the gap between the mating surfaces of the air handler/filter section and the flanges with the provided foam tape. When installing the top flange directly to an air handler without a filter section, foam tape should NOT be used. In this case, the hardware on the lip of the air handler roof panel should be removed, the flange slid under the lip and the hardware re-installed.

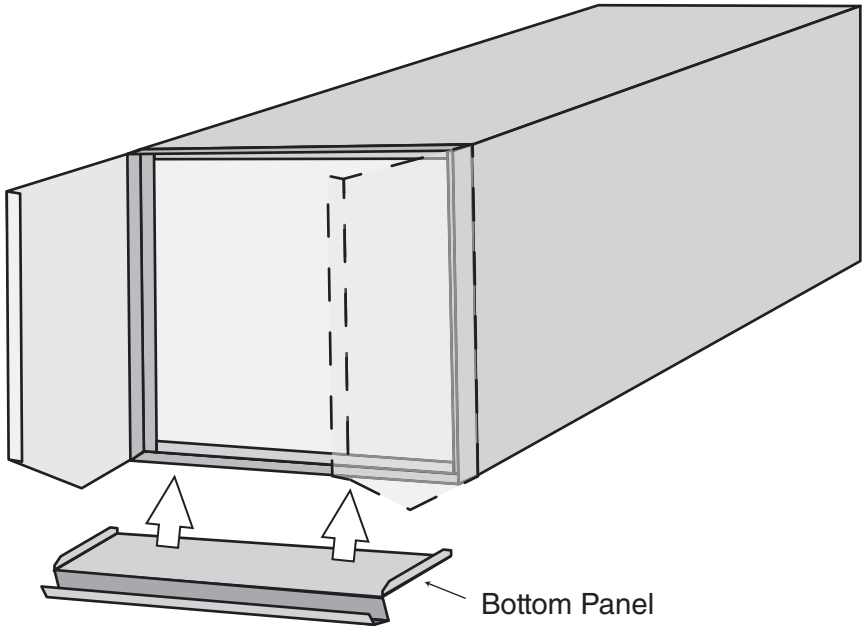
Step 12.3.2



Attach an innermost sidewall panel 1 (P/N 13X05080) to each side attaching flange using seven TEK self-tapping screws (P/N 13404).

NOTE: Flanges face inward.

Step 12.3.3

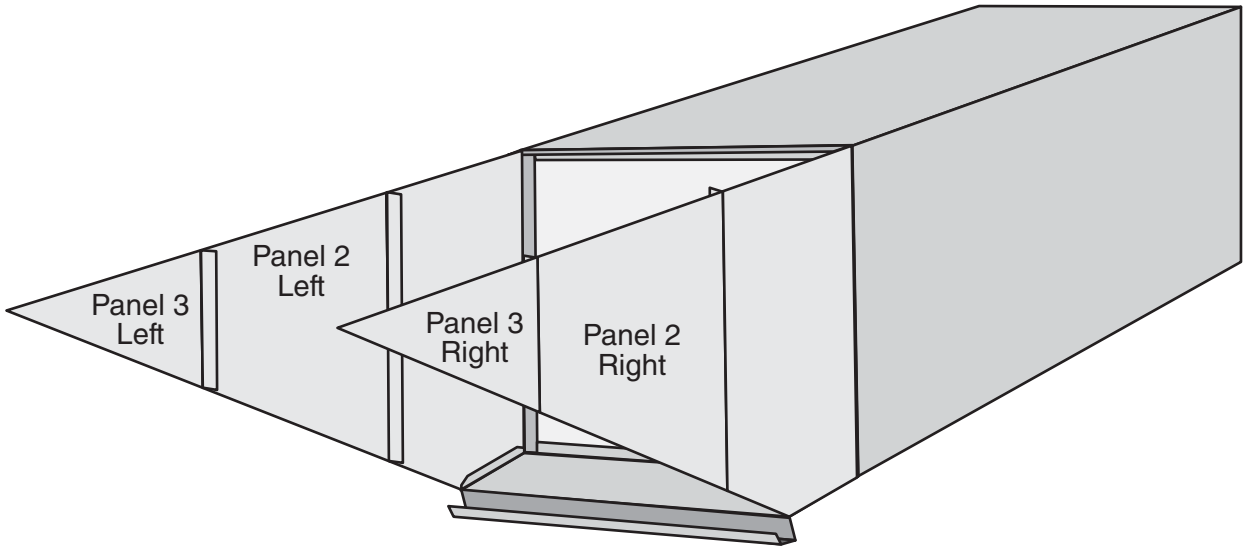


For Model B-2000: Attach the bottom panel (P/N 13205072) to the bottom mounting flange with seven TEK self-tapping screws (P/N 13404). Attach to each side panel with two TEK self-tapping screws (P/N 13404).

For Model B-3000: Attach bottom panel (P/N 13305072) to the bottom mounting flange with nine TEK self-tapping screws (P/N 13404). Attach to each side panel with two TEK self-tapping screws (P/N 13404).

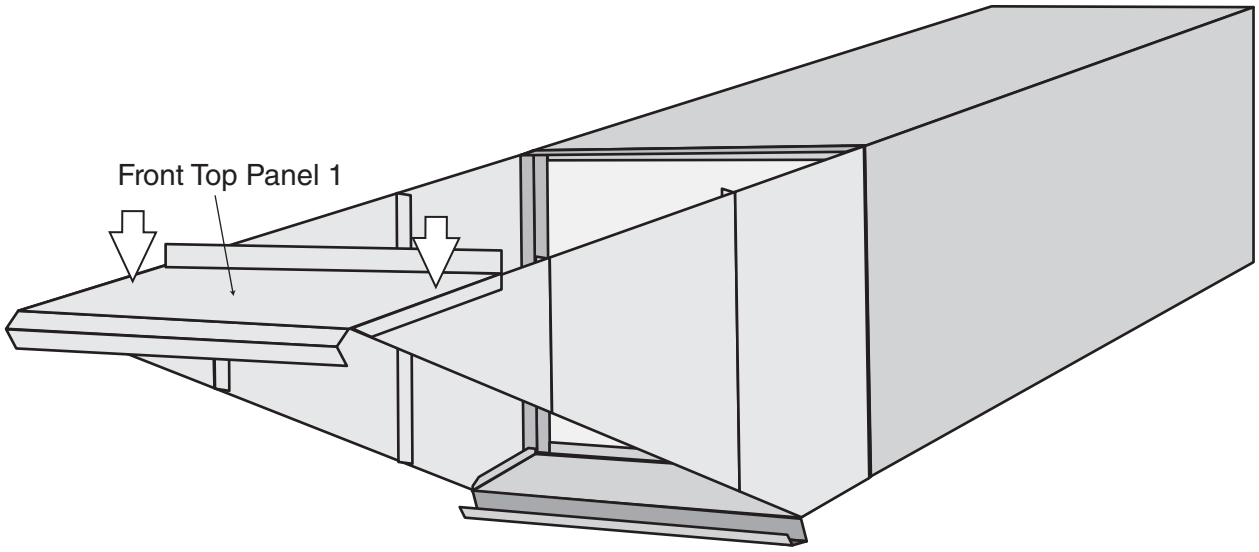
NOTE: Ensure that the side tabs of the bottom panel are to the inside of the side panels.

Step 12.3.4



Attach the middle sidewall panels (left panel P/N 13X05082, right panel P/N 13X05083) with four 5/16"-18x1 bolt (P/N 20507), 5/16 flat washer (P/N 20529), 5/16" flange nut (P/N 20509) each. Attach outermost sidewall panels (left panel P/N 13X05084, right panel P/N 13X05085) to each side of the inlet hood using three 5/16"-18x1 bolt (P/N 20507), 5/16 flat washer (P/N 20529), 5/16" flange nut (P/N 20509).

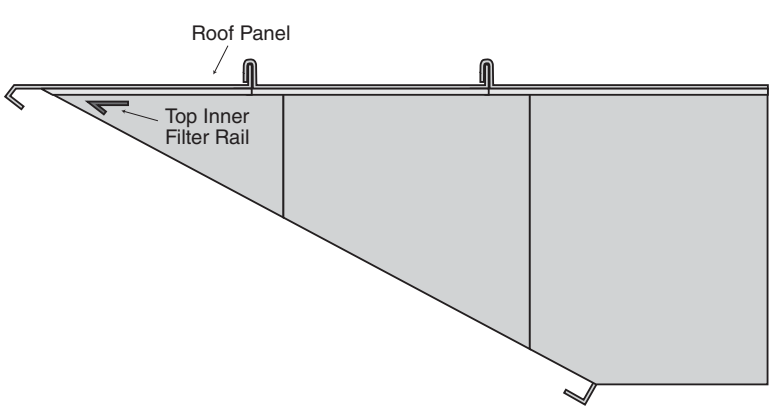
Step 12.3.5

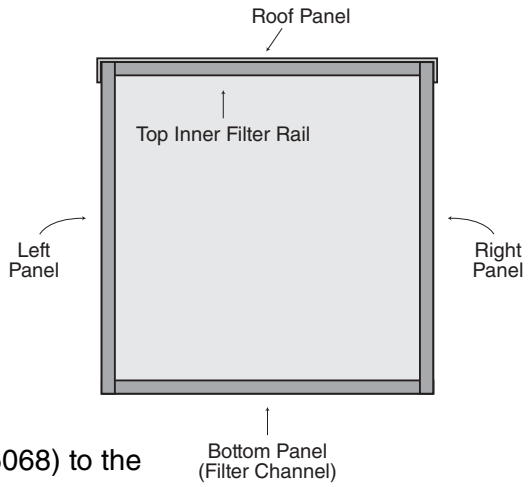


Attach front top panel (P/N 13X05077) to the sidewall panels using four TEK self-tapping screws (P/N 13404) on each side.

NOTE: Ensure that the side tabs of the top panel are to the outside of the side panels.

Step 12.3.6



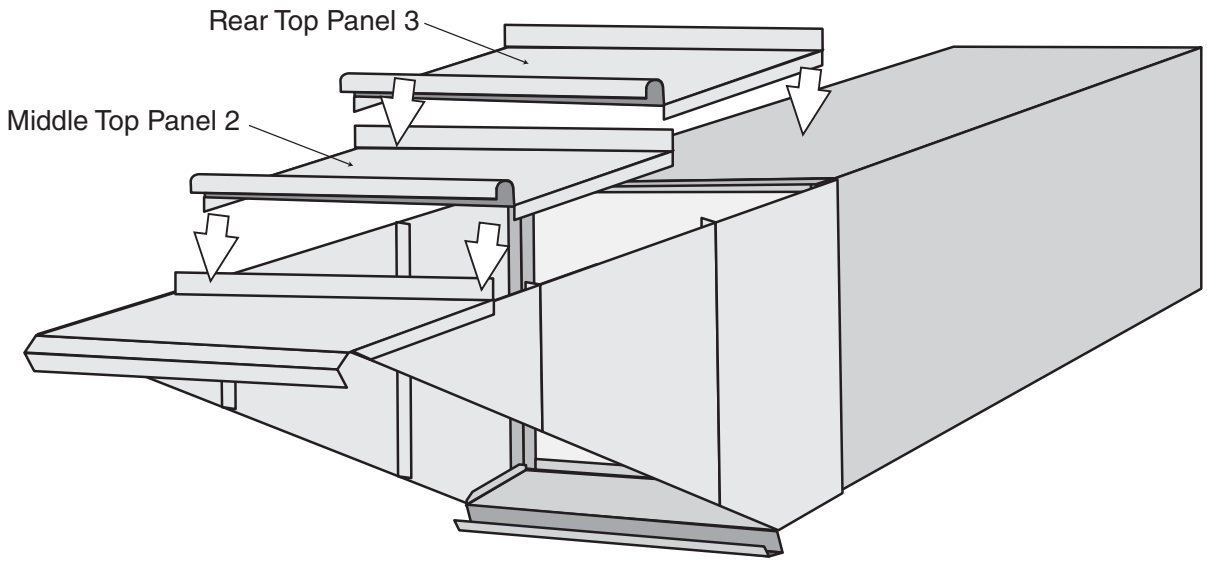


For Model B-2000: Attach the top inner filter rail (P/N 13205068) to the inside of the front top panel using five TEK self tapping screws (P/N 13404).

For Model B-3000: Attach top inner filter rail (P/N 13305068) to the inside of the front top panel using six TEK self tapping screws (P/N 13404).

NOTE: Ensure that the rail is installed with the ends tight against the flanges of the sidewall panels

Step 12.3.7



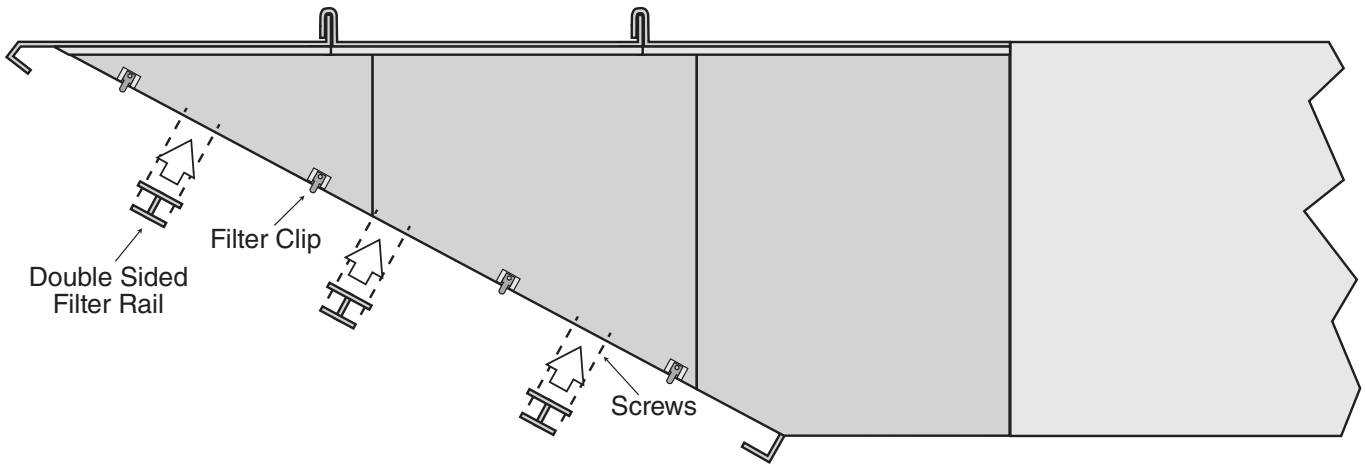
Attach middle top panel (P/N 1305076) with five TEK self-tapping screws (P/N 13404) on each side and with six 5/16-18x1 bolts (P/N 20507), 5/16 washers (P/N 20529) and 5/16 flange nuts (P/N 20509) at the J-bend joint.

For Model B-2000: Attach rear top panel (P/N 13205075) with five TEK self-tapping screws (P/N 13404) on each side, seven TEK self-tapping screws (P/N 13404) to the top mounting flange and with six 5/16-18x1 bolts (P/N 20507), 5/16 washers (P/N 20529) and 5/16 flange nuts (P/N 20509) at the J-bend joint.

For Model B-3000: Attach rear top panel (P/N 13305075) with five TEK self-tapping screws (P/N 13404) on each side, nine TEK self-tapping screws (P/N 13404) to the top mounting flange and with six 5/16-18x1 bolts (P/N 20507), 5/16 washers (P/N 20529) and 5/16 flange nuts (P/N 20509) at the J-bend joint.

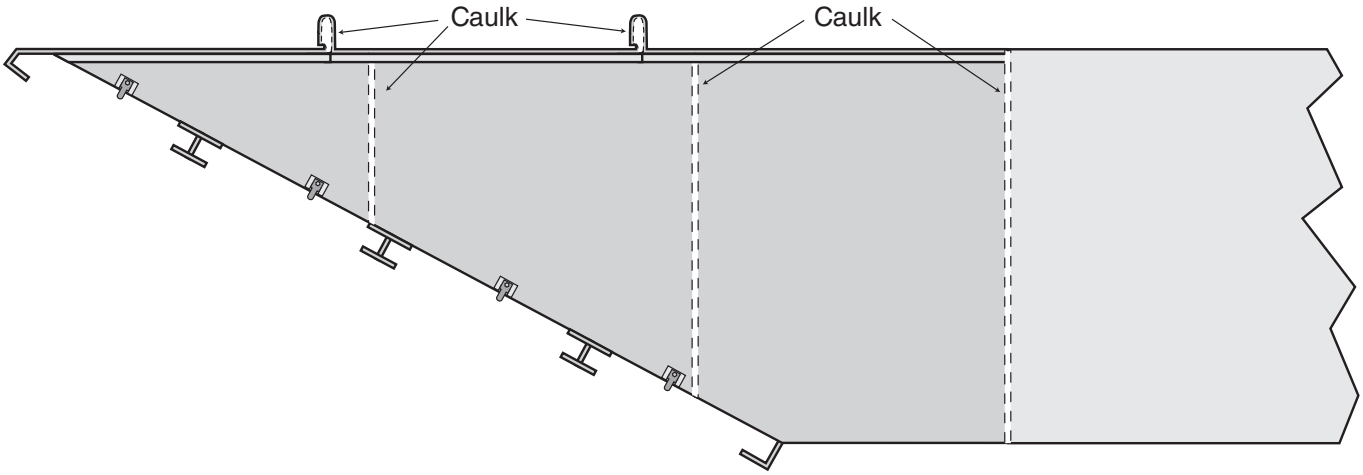
NOTE: Ensure that the side tabs of the roof panels are to the outside of the side panels and that the J-bends interlock the panel with the roof panel in front of it.

Step 12.3.8



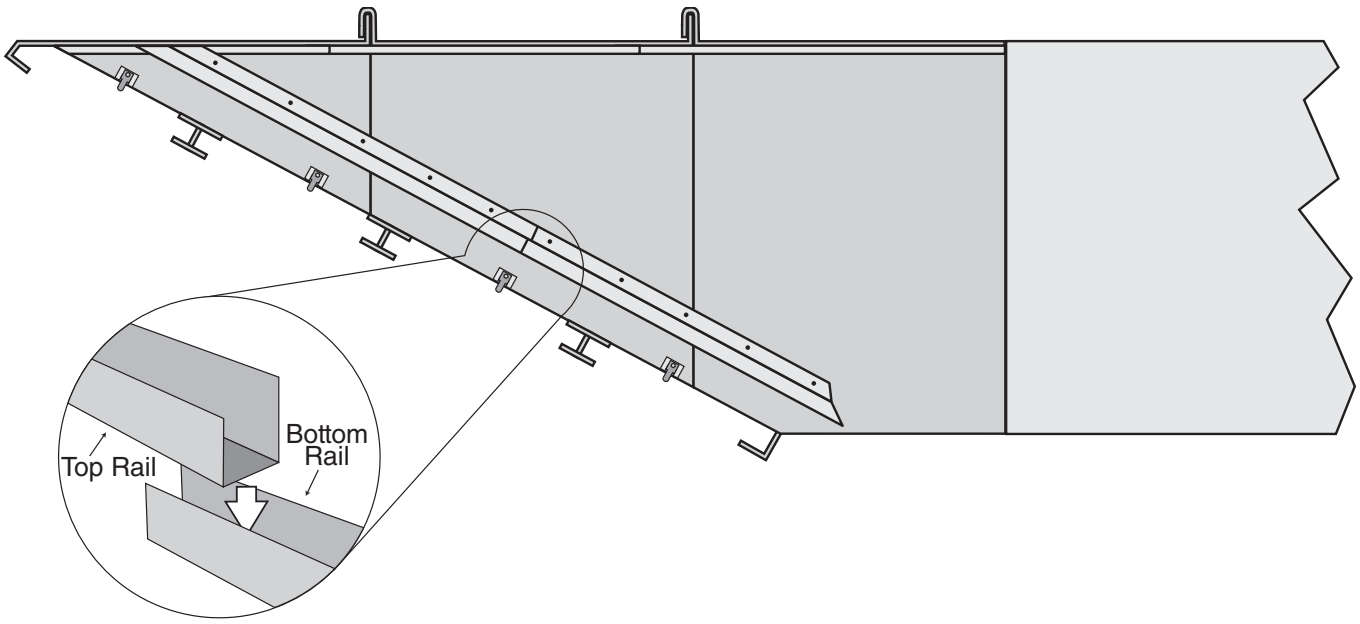
Attach the double-sided filter rails (P/N 13X05066) horizontally to the face of the inlet hood using two #10-24x½" bolts (P/N 27000) and #10-24 nuts (P/N 20698) on each side. When attaching the filter rails, insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters. Attach the filter clips with TEK self-tapping screws (P/N 13404). (First remove the washer as the washer will restrict the filter clip, making it difficult to open.)

Step 12.3.9



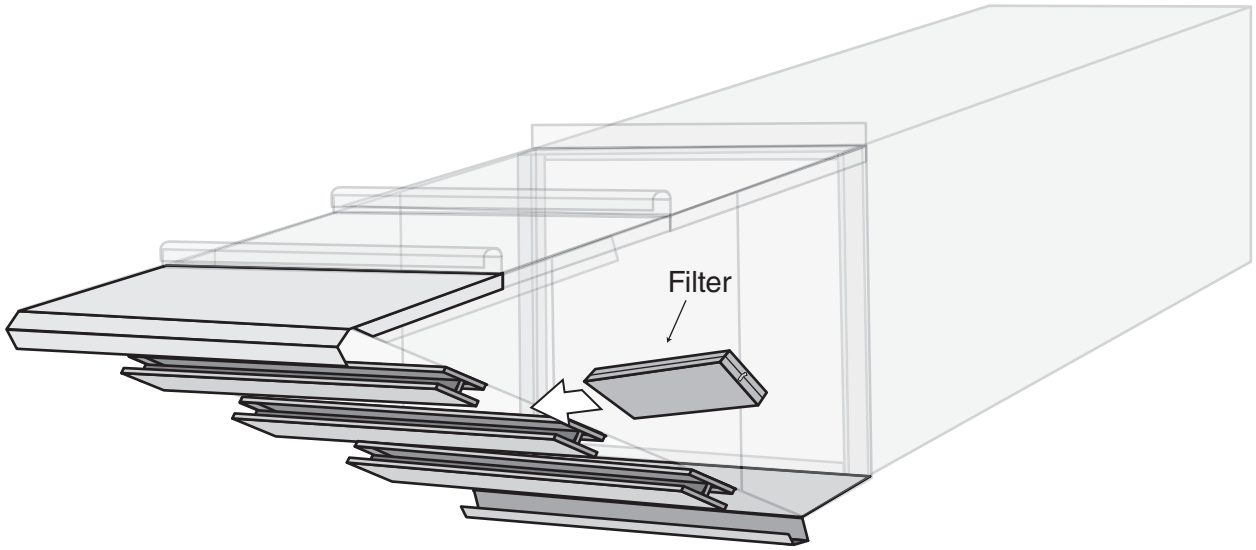
Caulk the seams between the inlet hood and the air handler/filter section and on the open sides of the J-bends that lock the roof panels together.

Step 12.3.10



When attaching the drip rail, ensure that the drip rails are positioned above the filter clips, using the provided holes in the sidewall panels. Attach drain channel to right side of inlet hood starting with the lower drip rail (P/N 13305094) using five TEK self-tapping screws (P/N 13404). Attach the upper right side channel (P/N 13305092) by sliding it inside the lower drip rail where they overlap use five TEK self-tapping screws (P/N 13404). Attach drip rail to left side of inlet hood starting with the lower drip rail (P/N 13305095) using five TEK self-tapping screws (P/N 13404). Attach the upper right side drip rail (P/N 13305093) by sliding it inside the lower drip raill where they overlap use five TEK self-tapping screws (P/N 13404). Apply caulk to the drip rails before attaching to the side panels.

Step 12.3.11

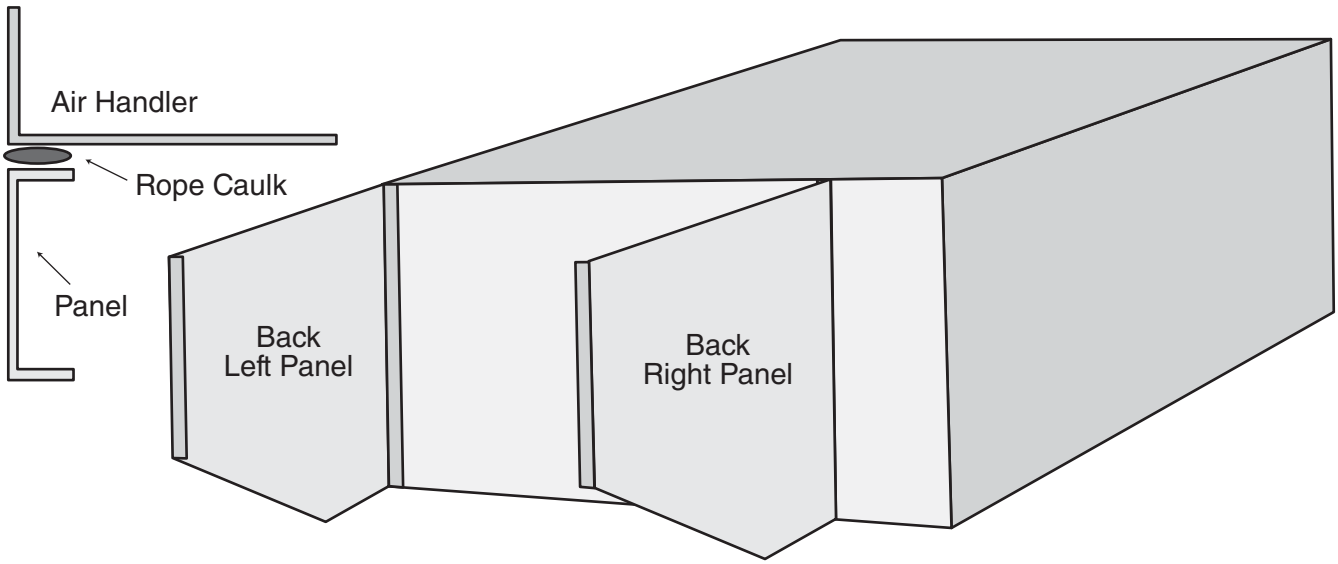


Load filters into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows should be pointing towards the air handler when installed in the proper orientation. Once filters are installed, close filter clips installed previously (*See Page 60, Step 12.3.8*) to hold filters in place.

12.4 Inlet Hood Assembly (B-4000 and B-5000)

Description	Part Number	Inlet Hood Without Filters	Inlet Hood With Moisture Limiter	Inlet Hood With Permanent Filters
		80305.1 (Galvanized) 80305.1W (Painted White) Quantity	80305.2 (Galvanized) 80305.2W (Painted White) Quantity	80305.3 (Galvanized) 80305.3W (Painted White) Quantity
Inlet Top Brace	300164	1	1	1
Back Left Panel	300214	1	1	1
Back Right Panel	300215	1	1	1
Front Left Panel	300216	1	1	1
Front Right Panel	300217	1	1	1
Front Top Panel	300218	1	1	1
Back Top Panel	300220	1	1	1
Intermediate Roof Brace	300222	1	1	1
Left Intermediate Bracket	300223	1	1	1
Right Intermediate Bracket	300224	1	1	1
Intermediate Horizontal Brace	300225	1	1	1
Hex Head Cap Screw 5/16-18 x ¾"	20902	72	72	72
Flange Nut 5/16"-18	20509	47	47	47
Flat Washer 5/16"	20511	72	72	72
Hex Nut #10-24	20548	7	9	32
Slt Rnd Screw #10-24 x ½"	20699	7	9	32
Rope Caulk	22986	50’ (15 m)	50’ (15 m)	50’ (15 m)
Zip Tape Flashing 3"	14502	24’ (7.3 m)	24’ (7.3 m)	24’ (7.3 m)
Support Bracket	10008	2	-	-
Horizontal Brace	300226	1	-	-
Right Inlet Bracket	300227	1	-	-
Left Inlet Bracket	300228	1	-	-
Moisture Limiter Frame Bottom Retainer	300177	-	1	-
Moisture Limiter Frame Left Side	300297	-	1	-
Moisture Limiter Frame Right Side	300298	-	1	-
Moisture Limiter Frame Top	300299	-	1	-
Moisture Limiter Frame Bottom	300300	-	1	-
Moisture Limiter Frame Rear Stiffener	300301	-	2	-
Moisture Limiter Frame Front Stiffener	601450	-	2	-
Moister Limiter Frame Bottom Pan	300505	-	1	-
Zip Screws	20003	-	10	-
¼"-14 x ¾" TEK Screw	28418	-	32	-
Moisture Limiter 12" x 96"	09460	-	12	-
Bottom Permanent Pan	300295	-	-	1
Permanent Vertical Bracket	300296	-	-	1
Intermediate Filter Rail	601193	-	-	6
Top Filter Rail	601194	-	-	1
Bottom Filter Rail	601195	-	-	1
Latch	20900	-	-	8
TEK Screw #10 x 1/2"	20539	-	-	12
Permanent Filter 24" x 24" x 2"	20627	-	-	24

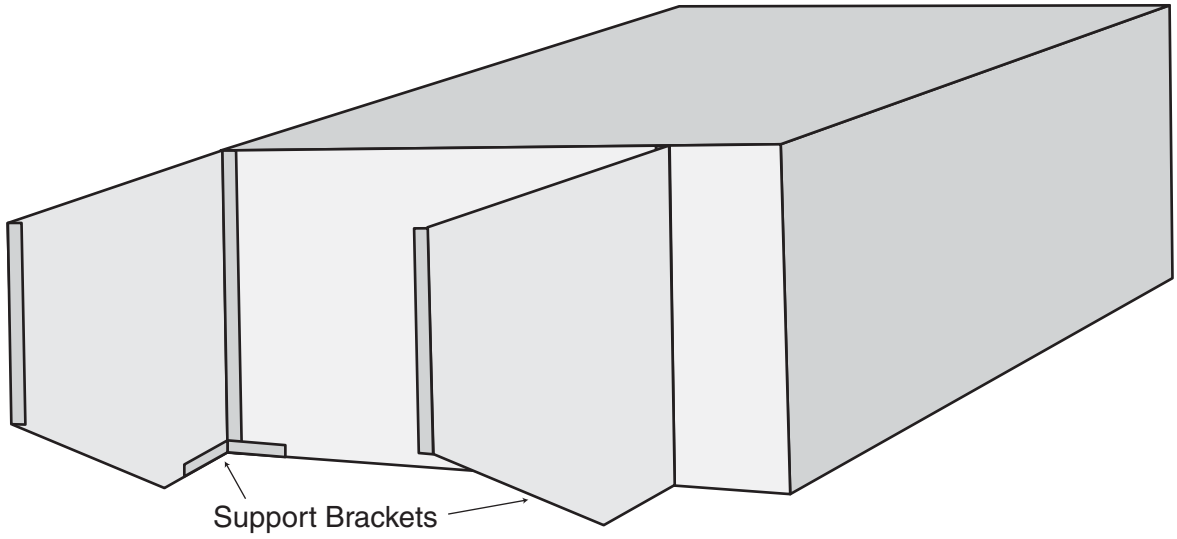
Step 12.4.1



Attach back left (P/N 300214) and back right (P/N 300215) panels to air handler using five 5/16-18x1 bolts (P/N 20902) and 5/16" washers (P/N 20511). Use rope caulk (P/N 22986) between the mating surfaces of the air handler and the side panels.

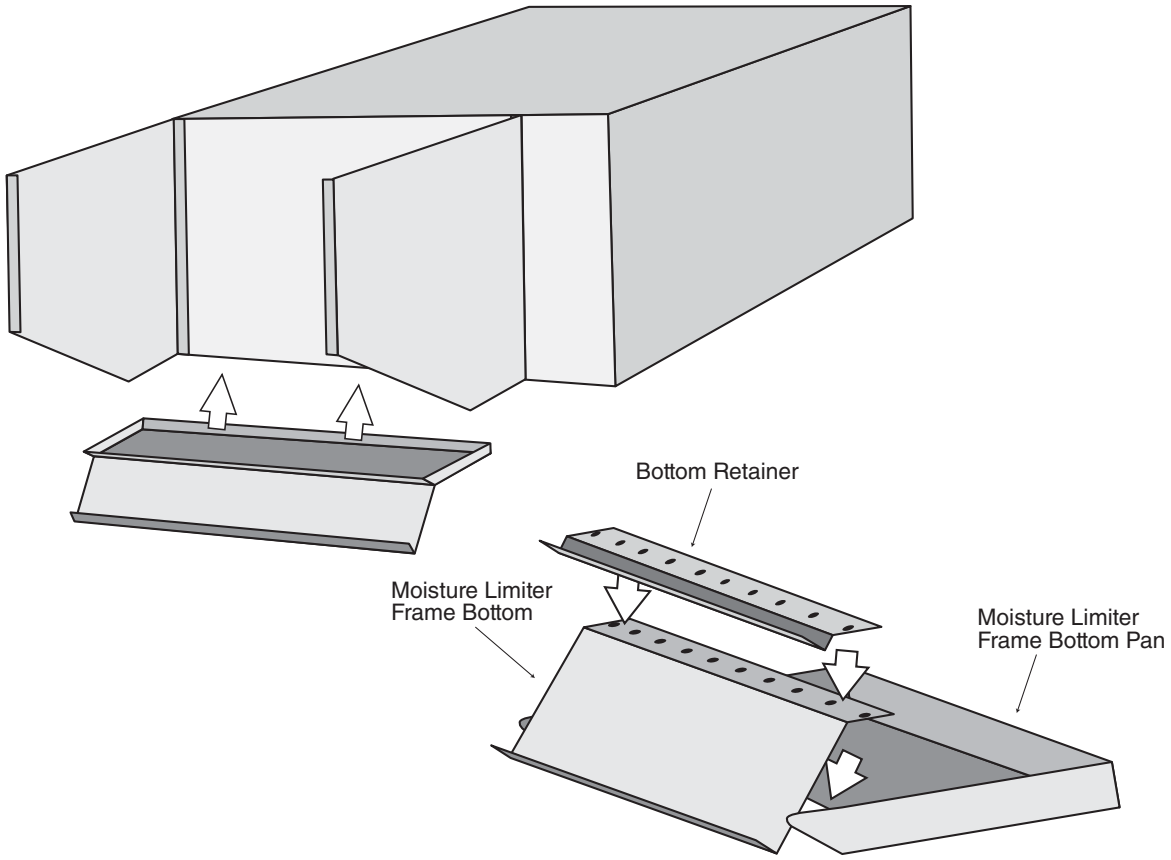
For inlet hoods with open face, see *Step 12.4.2A*, then continue to *Step 12.4.3*.
For inlet hoods with moisture limiter, see *Step 12.4.2B*, then continue to *Step 12.4.3*.
For inlet hoods with permanent filters, see *Step 12.4.2C*, then continue to *Step 12.4.3*.

Step 12.4.2A For Inlet Hood with Open Face



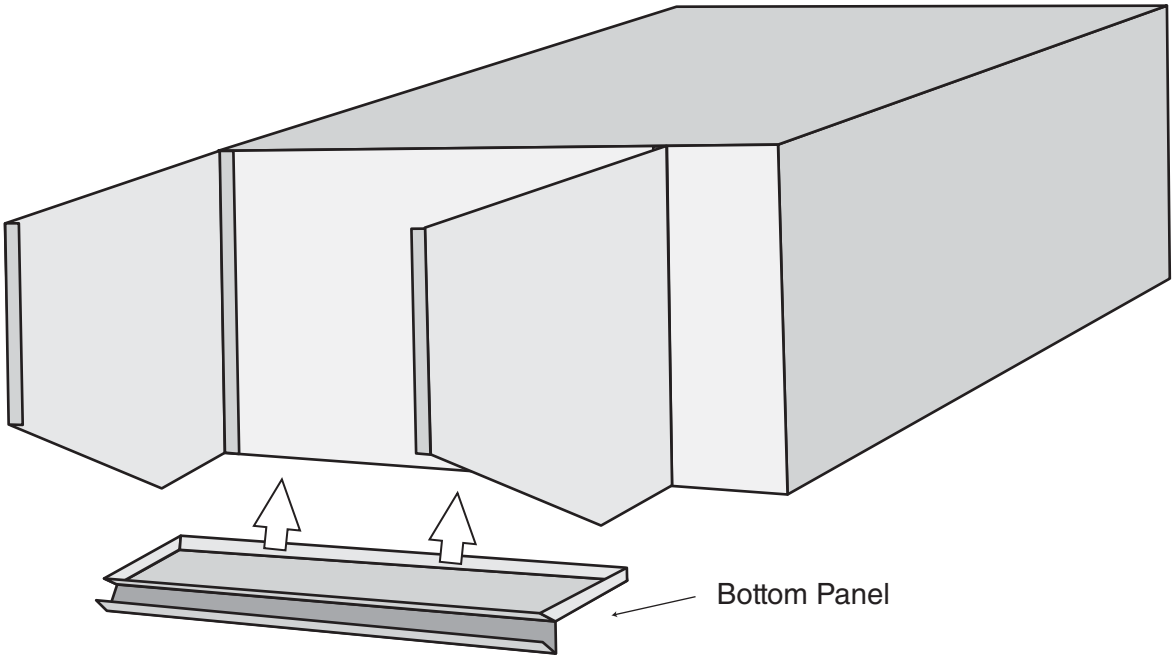
Attach support brackets (P/N 10008) to the bottom inside corner of the inlet hood. Attach to the air handler using existing hardware in the air handler cabinet. Attach to the bottom inside corner of the rear side panels using two 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509).

Step 12.4.2B For Inlet Hood with Moisture Limiter



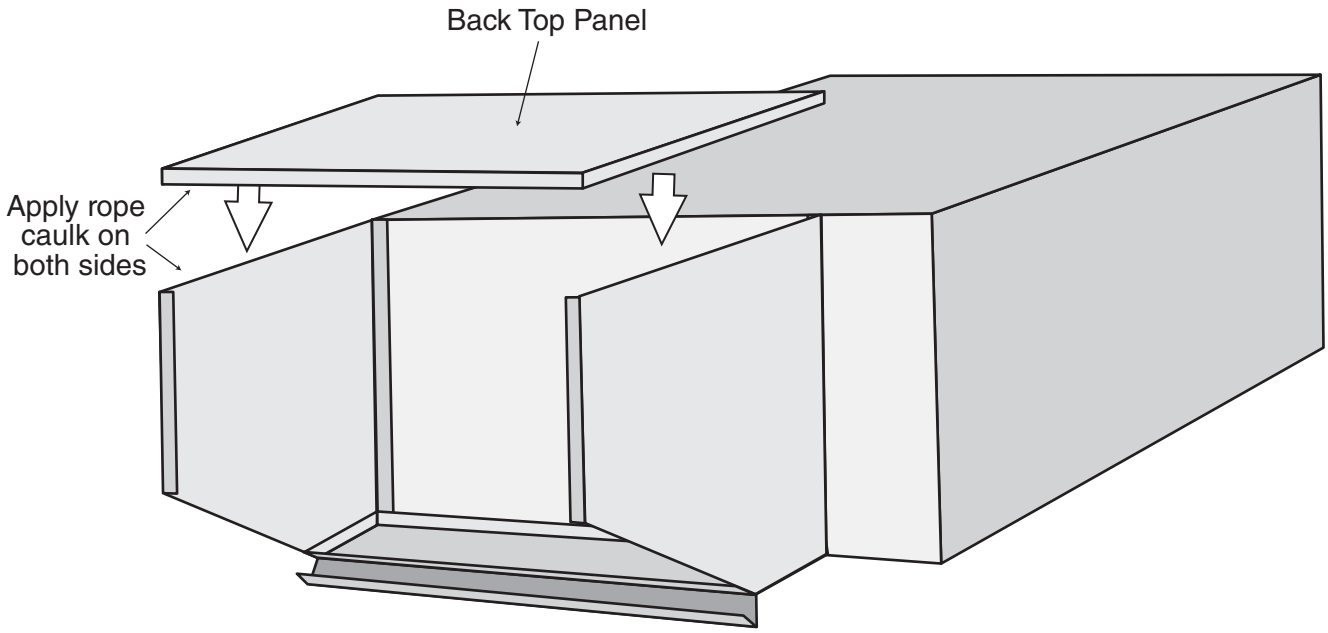
Attach the moisture limiter frame bottom pan (P/N 300505) to the moisture limiter frame bottom (P/N 300300) and bottom retainer (P/N 300177) using ten zip screws (P/N 20003). Attach the bottom pan assembly to the air handler just below the inlet opening and inside of the side panels installed previously (*See Page 63, Step 12.4.1*). Attach to the air handler using existing hardware in the air handler cabinet. Attach to the side panels using two 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509). Use rope caulk (P/N 22986) between the mating surfaces of the air handler and the bottom panel.

Step 12.4.2C For Inlet Hood with Permanent Filters



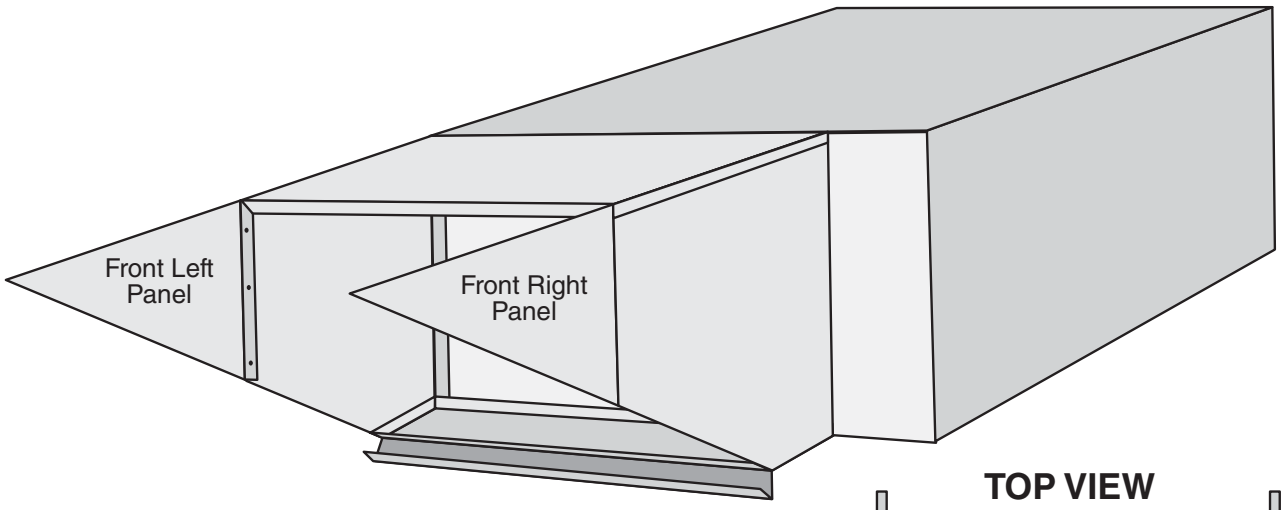
Attach the bottom panel (P/N 300295) to the air handler just below the inlet opening and inside of the side panels installed previously (*See Page 63, Step 12.4.1*). Attach to the air handler using existing hardware in the air handler cabinet. Attach to the side panels using two 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509). Use rope caulk (P/N 22986) between the mating surfaces of the air handler and the bottom panel.

Step 12.4.3

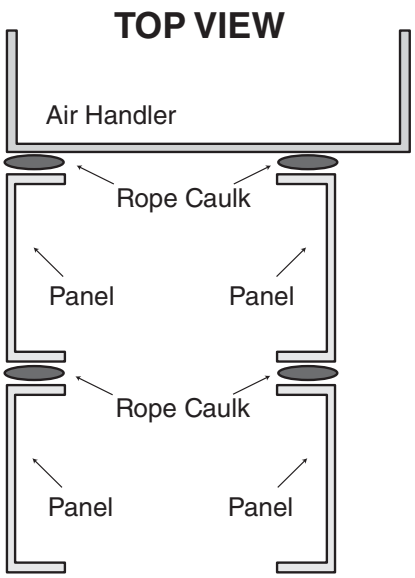


Attach the back top panel of the hood (P/N 300220) to the air handler just above the inlet opening and overlapping the side panels installed previously (*See Page 63, Step 12.4.1*). Attach to the air handler using fifteen 5/16-18x1 bolts (P/N 20902) and 5/16" washers (P/N 20511). Attach to the side panels using four 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509) on each side. Use rope caulk (P/N 22986) between the mating surfaces of the air handler and the rear top panel.

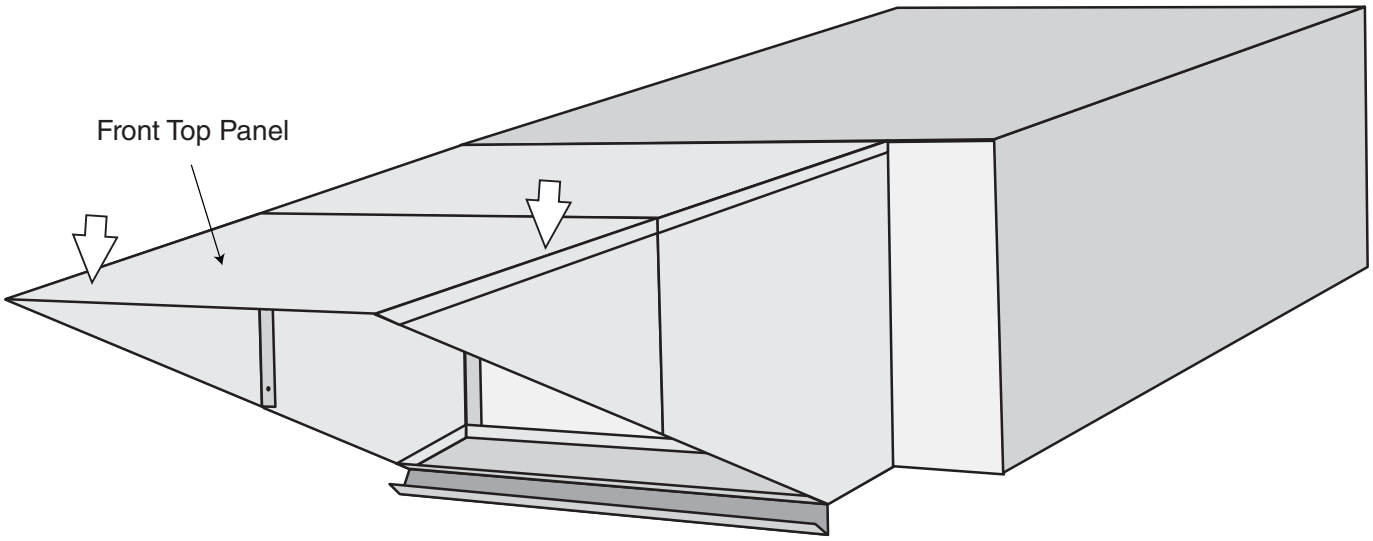
Step 12.4.4



Attach left (P/N 300217) and right (P/N 300216) front panels to left and right rear panels using three 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509) each. Use rope caulk between the mating surfaces of front and rear panels.



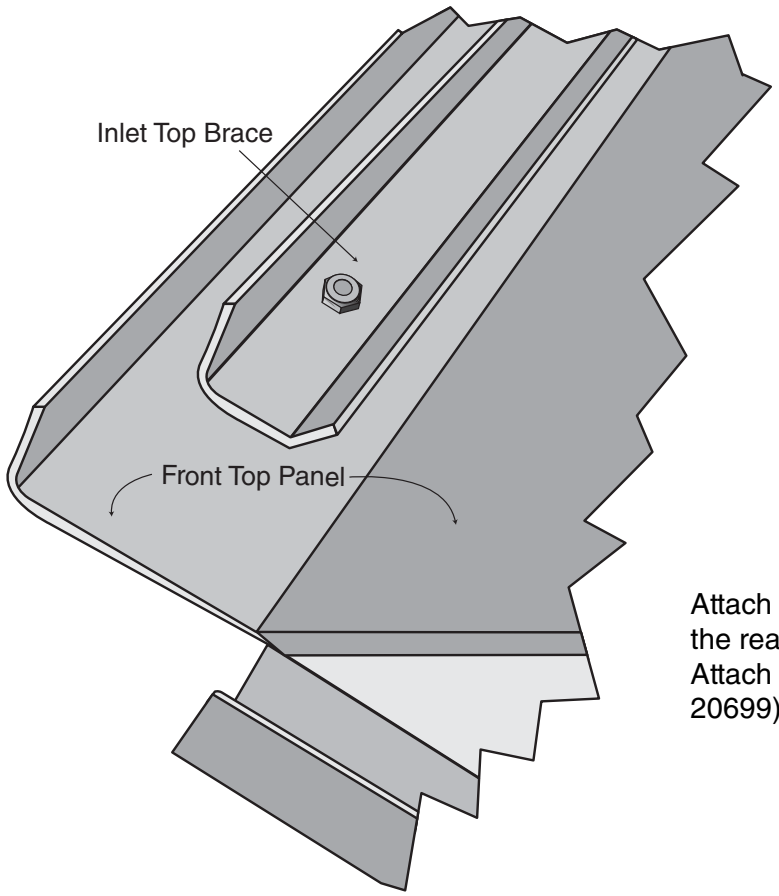
Step 12.4.5



Attach the front top panel (P/N 300218) to the back top panel, overlapping the side panels installed previously (*See Page 66, Step 12.4.4*). Attach to the side panels using four 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509) on each side and back top panel using nine 5/16-18x1 bolts (P/N 20902), 5/16" washers (P/N 20511) and 5/16" flange nuts (P/N 20509). Use rope caulk (P/N 22986) between the mating surfaces of front and rear panels.

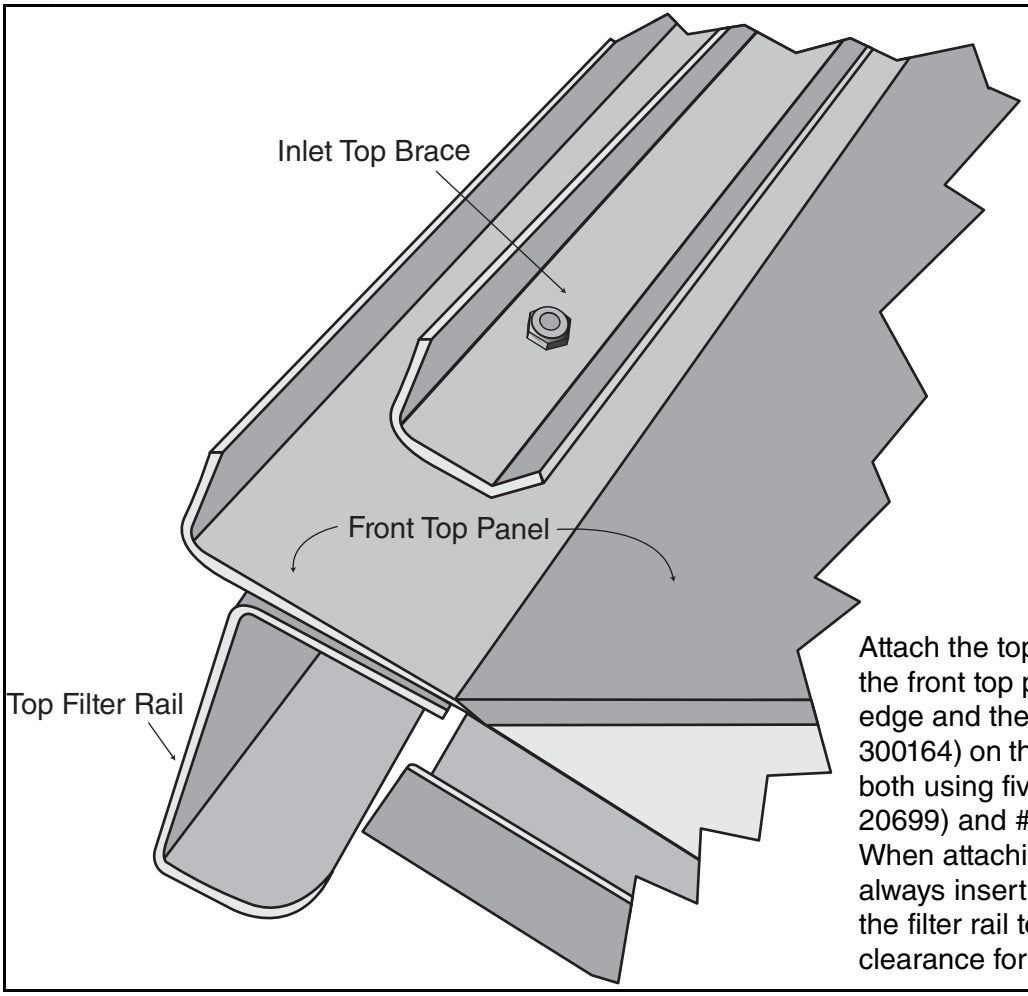
For inlet hoods with open face or moisture limiter, see *Step 12.4.6A*, then continue to *Step 12.4.7*.
For inlet hoods with permanent filters, see *Step 12.4.6B*, then continue to *Step 12.4.7*.

Step 12.4.6A For Inlet Hoods with Open Face or with Moisture Limiter



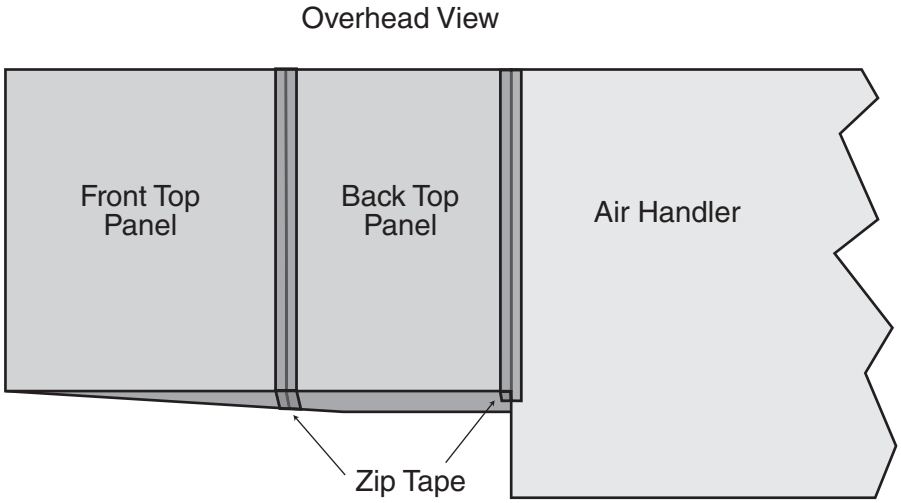
Attach the inlet top brace (P/N 300164) to the rear outside edge of the front top panel. Attach using five #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20548).

Step 12.4.6B Inlet Hoods with Permanent Filters



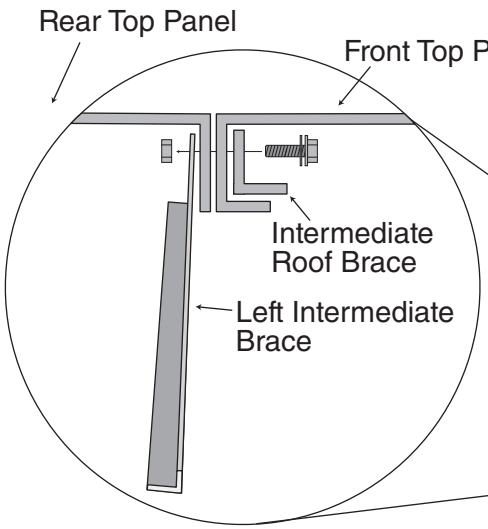
Attach the top filter rail (P/N 601194) to the front top panel on the front inside edge and the inlet top brace (P/N 300164) on the rear outside edge. Attach both using five #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20648). When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.

Step 12.4.7

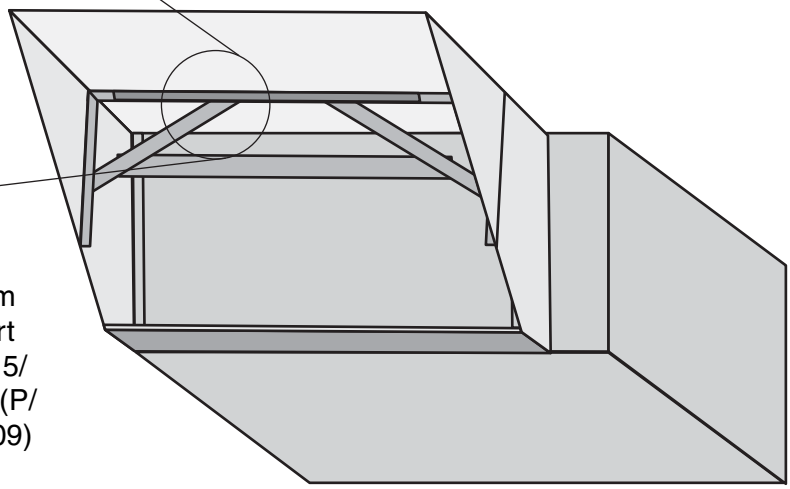


Apply 3" zip tape flashing (P/N 14502) centered over the top seams. These seams are located between the air handler and the rear top panel of inlet hood and also between the front and back top panels of the inlet hood.

Step 12.4.8



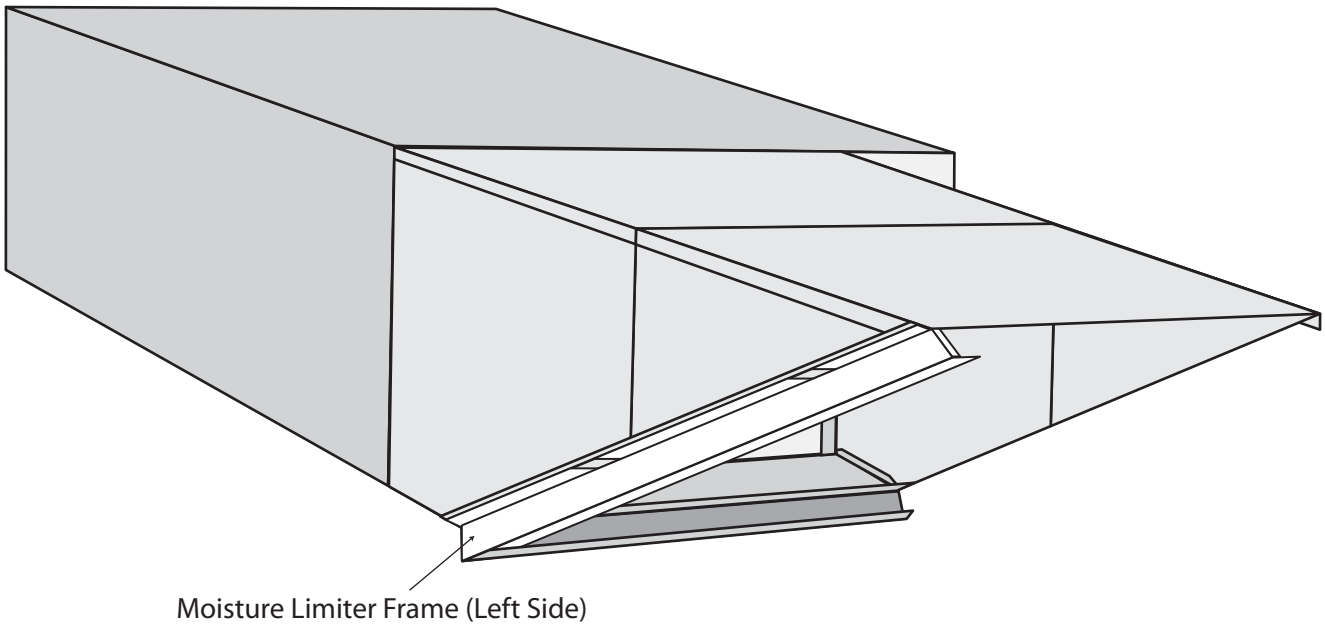
Assemble inner support frame. Attach the intermediate roof brace (P/N 300222) with existing seam hardware to the seam of the front and back top panels with the angle opening away from the air handler. Attach the left (P/N 300223) and right (P/N 300224) intermediate roof braces with the seam hardware at the connecting points with the angle opening towards the air handler.



Attach the intermediate roof brace (P/N 300225) with the angle opening away from the air handler, to each of the side support left and right intermediate braces using a 5/16-18x1 bolts (P/N 20902), 5/16" washer (P/N 20511) and a 5/16" flange nut (P/N 20509) on each side.

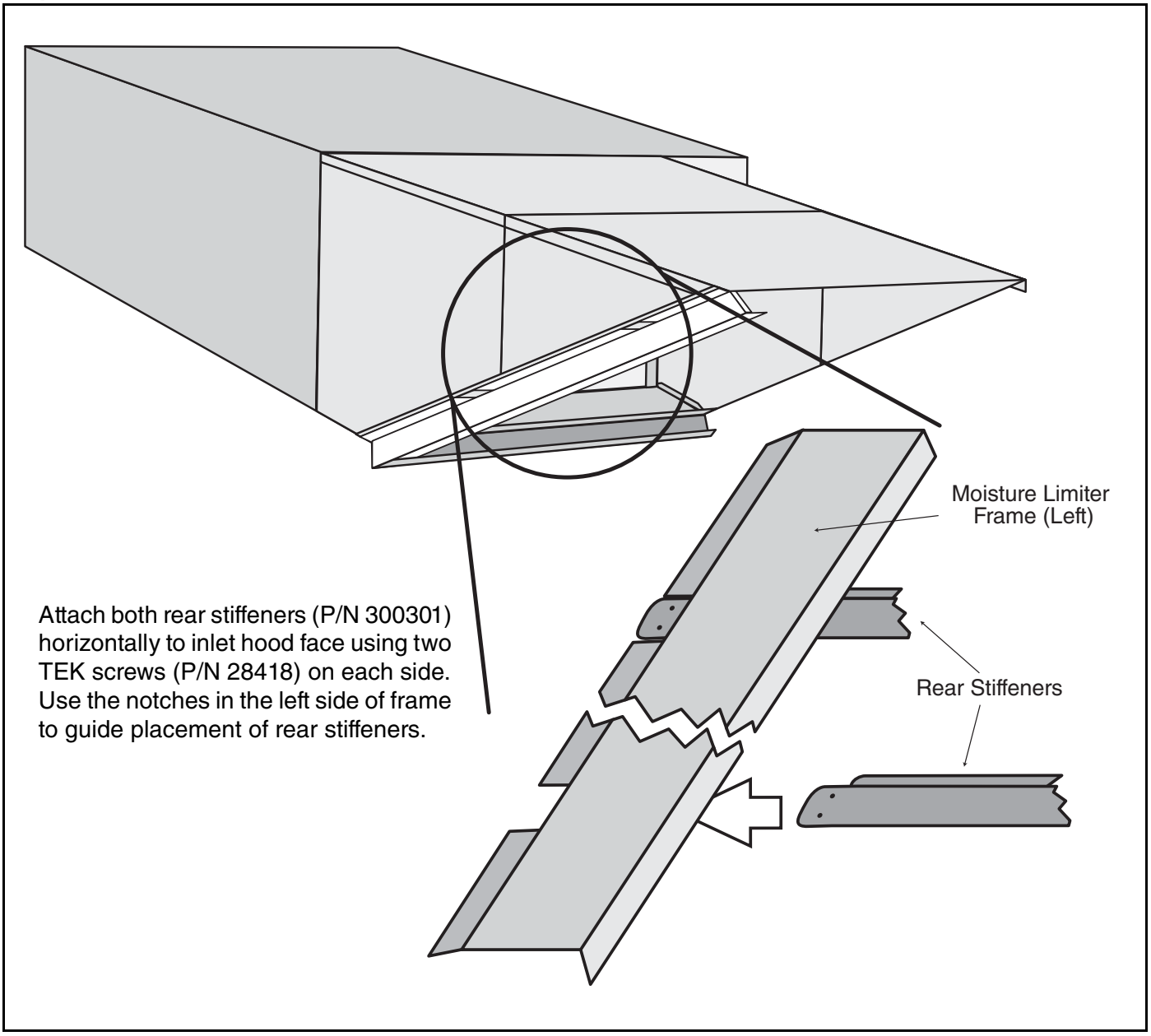
For inlet hoods with open face, the instructions end here.
For inlet hoods with moisture limiters, continue with *Step 12.4.9 - Step 12.4.14*.
For inlet hoods with permanent filters, continue with *Step 12.4.15 - Step 12.4.18*.

Step 12.4.9 Inlet Hoods with Moisture Limiters



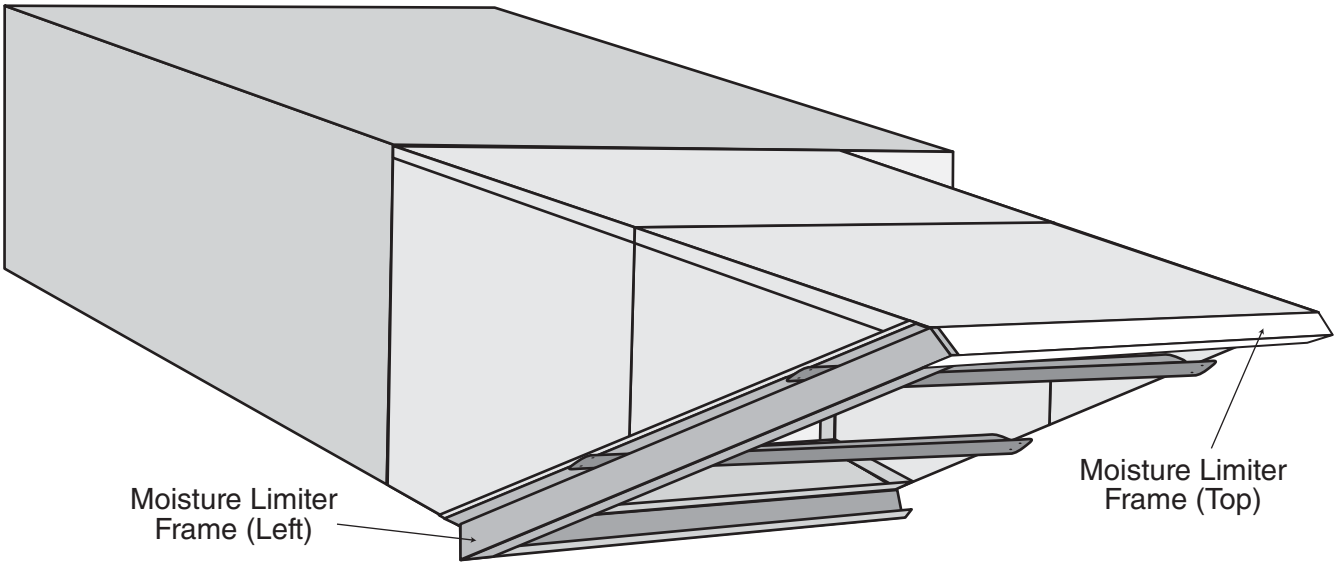
Attach left side (P/N 300297) of moisture limiter frame to the left side of the inlet hood rain gutter using eight TEK screws (P/N 28418). Attach to the bottom pan assembly (P/N 300505) with two #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20648).

Step 12.4.10



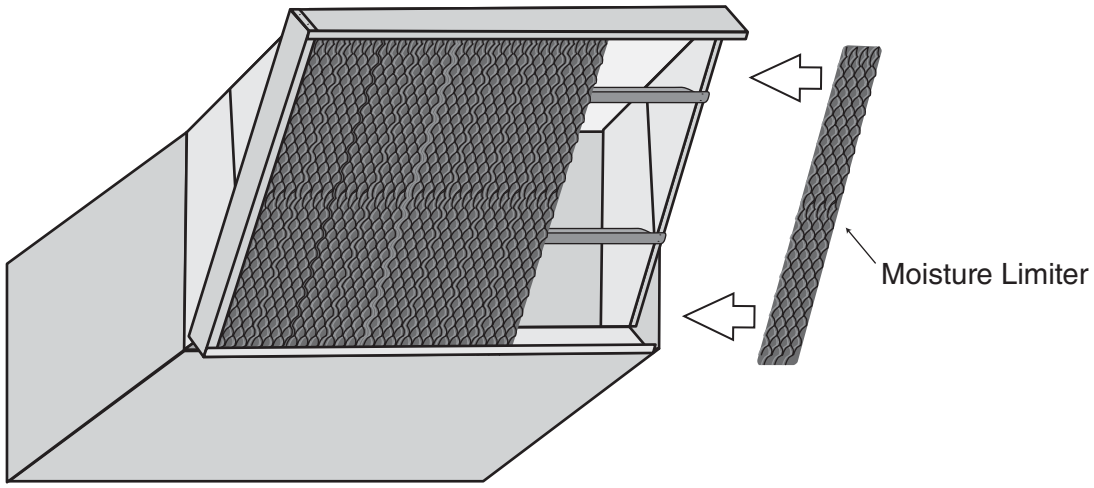
Attach both rear stiffeners (P/N 300301) horizontally to inlet hood face using two TEK screws (P/N 28418) on each side. Use the notches in the left side of frame to guide placement of rear stiffeners.

Step 12.4.11



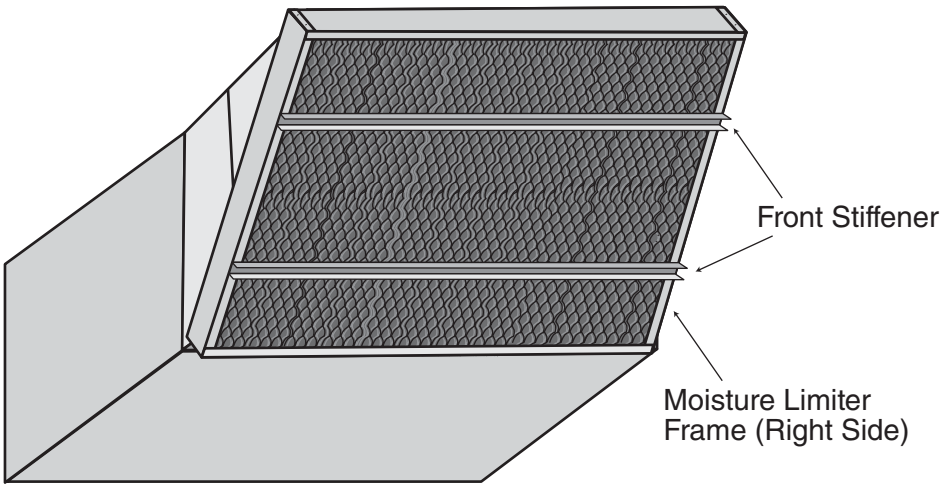
Place the moisture limiter frame top (P/N 300299) under the top flange of the moisture limiter frame left side (P/N 300297) and to the top of the inlet hood. Attach to the top of the inlet hood using nine #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20648). Attach to the left side of the frame using two #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20648).

Step 12.4.12



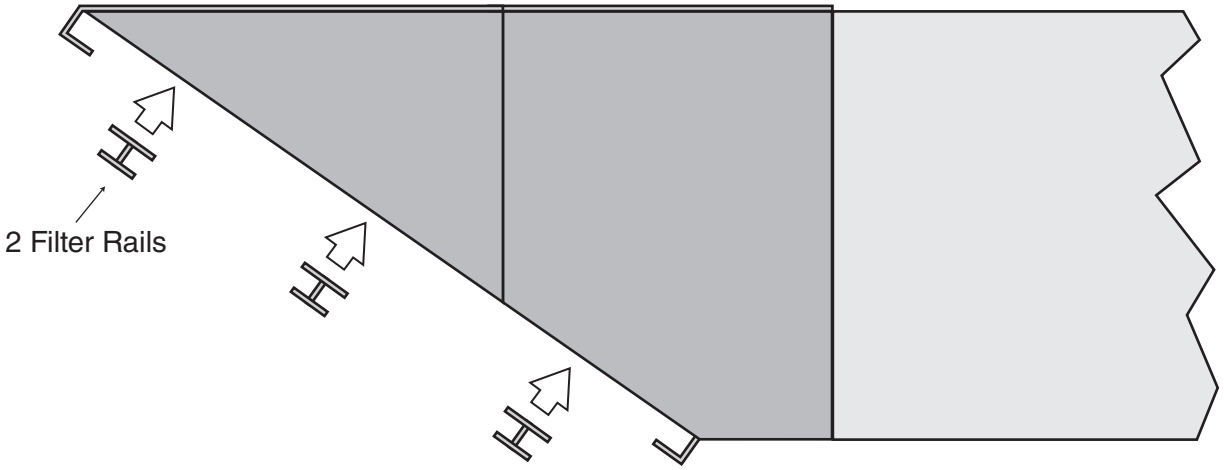
Insert the 12 pieces of 12" (30.5cm) x 96" (243.8cm) moisture limiter media (P/N 09460) from the right side with the long dimension running top to bottom.

Step 12.4.13



Place the moisture limiter frame right side (P/N 300298) so that the flange at the top overlaps the top of the frame. Attach to the inlet hood rain gutter using eight TEK screws (P/N 28418). Attach to the bottom pan assembly and top with two #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20648) each. Attach front stiffeners (P/N 601450) to the left and right side of the moisture limiter frame using four TEK screws (P/N 28418) for each support.

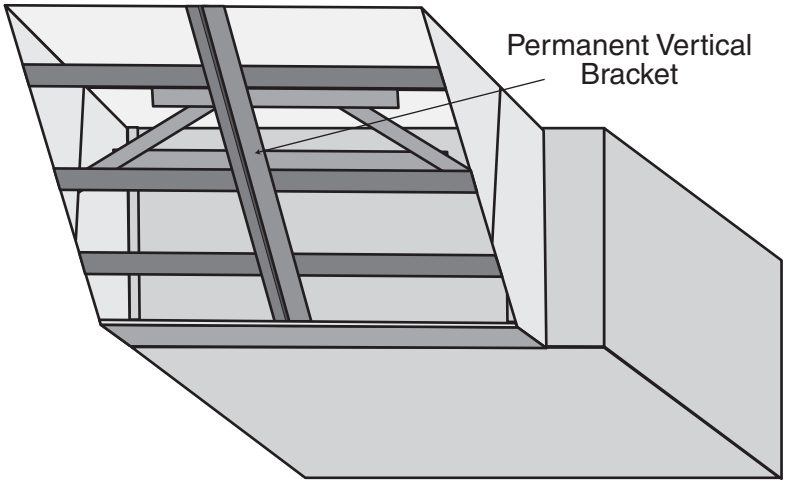
Step 12.4.14 For Inlet Hoods With Permanent Filters



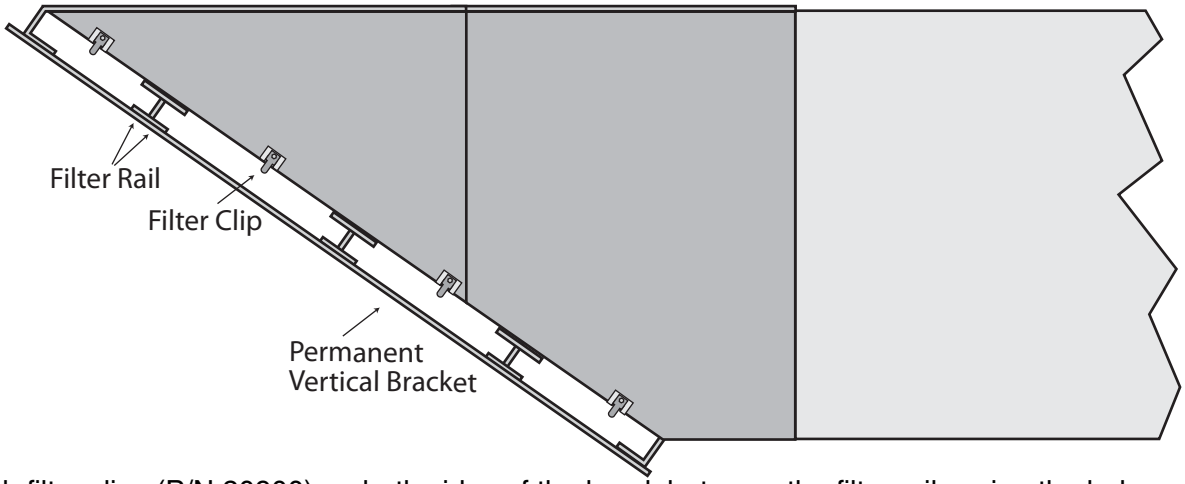
Attach 3 pair of filter rails (P/N 601193) horizontally to the face of the inlet hood. Attach using two #10-24x½" bolts (P/N 20699) and #10-24 nuts (P/N 20548) on each side. When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.

Step 12.4.15

Attach the permanent vertical bracket (P/N 300296) vertically to the face of the inlet hood. Attach to the filter rails using a #10-24x½" bolt (P/N 20699) and a #10-24 nut (P/N 20548) at each filter rail, use two at each back-to-back pair of filter rails. When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.

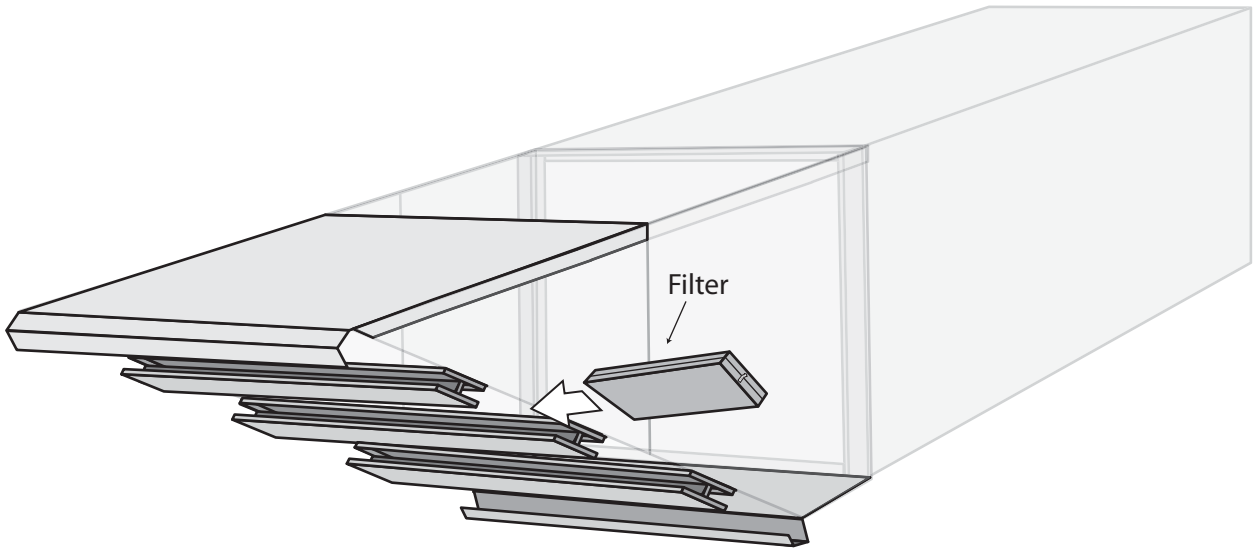


Step 12.4.16



Attach filter clips (P/N 20900) on both sides of the hood, between the filter rails using the holes provided. Attach using a TEK screw (P/N 20539) for each clip.

Step 12.4.17



Load filters (P/N 09701) into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows will be pointing towards the air handler when installed in the proper orientation. Close the filter clips installed previously (*See Page 73, Step 12.4.17*) to hold the filters in place once they are installed.

12.5 Inlet Hood Installation

The inlet hood may be installed either onto the inlet of the air handler or to an outside wall.

12.5.1 Inlet Hood Installation to Wall

Use lagbolts to install the inlet hood on an exterior wall. Once the inlet hood is in place, the edges must be sealed to the wall with the proper sealant. For models B-650 - B-5000 that have the inlet hood mounted to a wall, assemble the hood prior to mounting, then mount as described below.

12.5.2 Inlet Hood Installation to Air Handler (B-350)

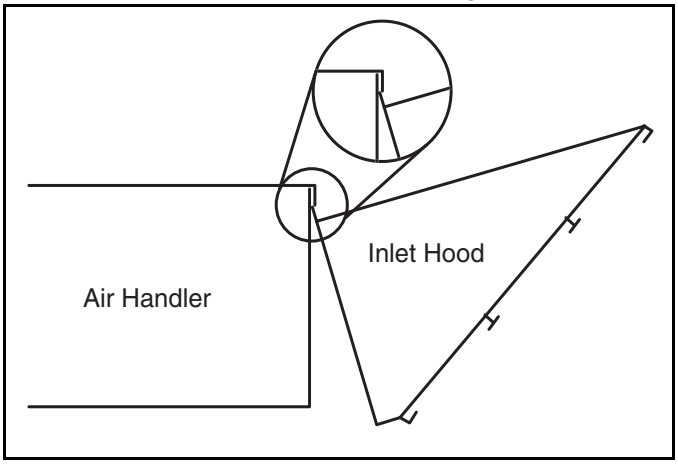
Mount the inlet hood to the inlet end of the air handler, first remove the hardware in the top drip edge of the air handler. Tuck the top flange of the hood behind the top drip edge. *See Page 74, Figure 31*. Replace the hardware, screw together the top drip edge of the air handler, top flange of the inlet hood and the air handler wall panel.

NOTE: After installing the inlet hood, all hardware must be tightened with a torque wrench. The roof, side and bottom seams must be caulked (supplied by others).

12.5.3 Inlet Hood Installation to Air Handler (B-650 - B-5000)

Inlet hoods are assembled onto the air handler.

FIGURE 31: Inlet Hood Positioning



SECTION 13: SERVICE PLATFORM (B-4000 AND B-5000)

⚠ WARNING			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

13.1 Service Platform Installation

Step 1:

Attach service platform channels (P/N 61006) to air handler legs using four ½"-13x1¼" bolts (P/N 20903), ½" washers (P/N 20523) and ½"-13 nuts (P/N 20493) on each channel.

Step 2:

Attach the frame assembly (P/N 610008) to the platform channels (P/N 61006) using four ½"-13x1¼" bolts (P/N 20903), ½" washers (P/N 20523) and ½"-13 nuts (P/N 20493) on each side.

Step 3:

Attach the access side hand rail assembly (P/N 610004) to the air handler and top of service platform channel using six ¼"-20x1" bolts (P/N 20801), ¼" washers (P/N 20503) and ¼"-20 flange nuts (P/N 20489). Attach two 5/16" eye bolts through the access opening side of the hand rail.

Step 4:

Attach the front hand rail (P/N 610005) to the deck with four 3/8"-16x1 bolts (P/N 20517), 3/8" washers (P/N 20515) and 3/8"-16 nuts (P/N 20517). Attach two 5/16" eye bolts (P/N 20688) through the access opening side of the hand rail.

Step 5:

Assemble the non access side hand rail (P/N 610003) so that the long axis angles open opposite the short axis angles and all angles should open towards the center of the hand rail assembly. Attach angle pieces using one 3/8"-16x1 bolt (P/N 20517), 3/8" washer (P/N 20515) and 3/8"-16 nut (P/N 20517) in each corner.

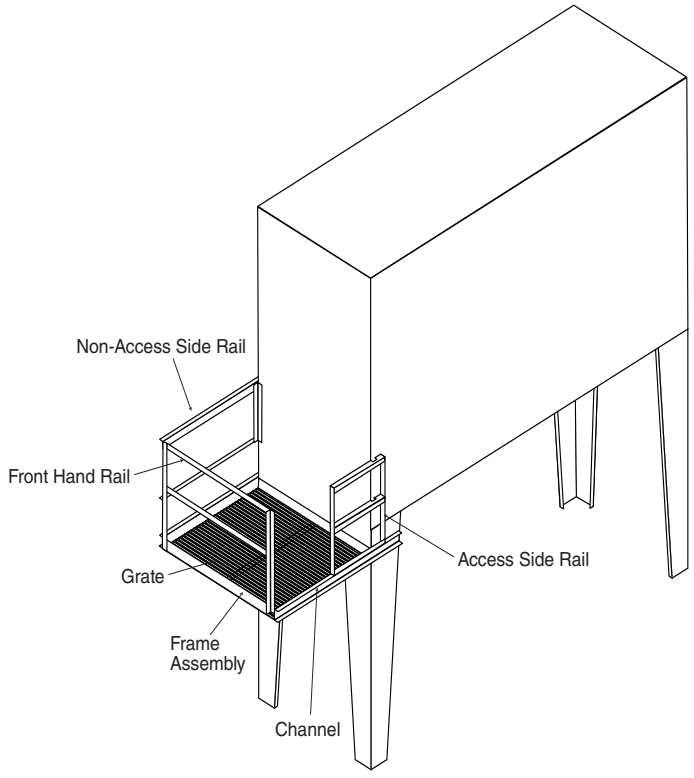
Step 6:

Attach the non access side hand rail to the front hand rail with two 3/8"-16x1 bolts (P/N 20517), 3/8" washers (P/N 20515) and 3/8"-16 nuts (P/N 20517). Attach the non access side handrail to the air handler using three ¼" self tapping screws (P/N 28418).

Step 7:

Place the grates (P/N 30877) in place so that the seam between them is parallel to the front hand rail. String the chain (P/N 20456) across the service platform opening between each set of eye bolts, using the provided hook (P/N 20687) at one end and the provided snap hook (P/N 20689) on the other.

FIGURE 32: Service Platform Installation



Part	Description	Qty
610003	Non-Access Side Rail	1
610005	Front Hand Rail	1
610004	Access Side Rail	1
610006	Channel	2
610008	Frame Assembly	1
20688	Bolt, Eye	4
20687	Hook	2
20689	Snap Hook	2
20456	Chain	8’
20513	Nut, 3/8"-16	10
20515	Washer, 3/8"	10
20517	3/8"-16x1	10
20801	1/4"-20x1	9
20509	Nut, 5/16"-18	8
20489	1/4" Flg, Nuts	9
20903	1/2"-13x1-1/4"	16
20493	Nut, 1/2"-13	16
20523	1/2" Washer	16
30877	Grate	2
28418	1/4" TEK screw	9

NOTE: Ladder not included.

SECTION 14: DISCHARGE HEADS

⚠ WARNING

Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**

Failure to follow these instructions can result in death, injury or property damage.

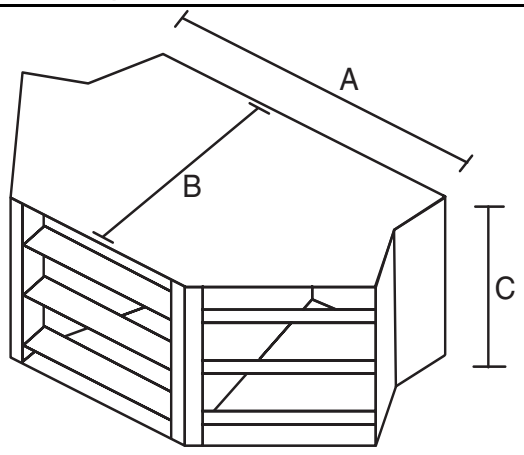
Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number.

14.1 One-Way and Three-Way Discharge Head Installation

All discharge heads are shipped assembled. The discharge head is designed for mounting to the face of the air handler (covering the discharge opening) or to an interior wall. All discharge heads must be field supported (by others). The discharge head has four outward-turned flanges. If the discharge head is to be installed to the face of the air handler, install hardware (provided by others) on all four sides of the discharge head.

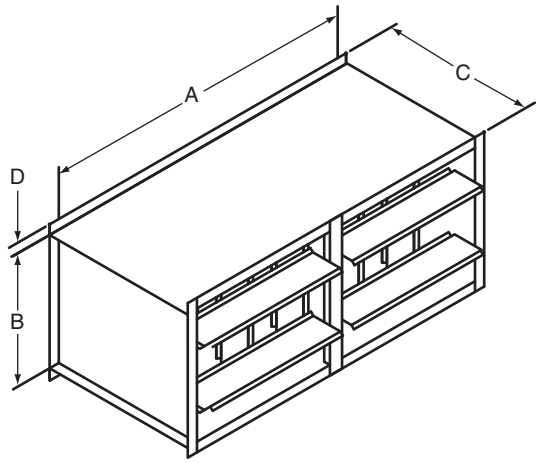
To install the discharge head on an interior wall, drill holes in the flanges on all four sides of the discharge heads to accommodate lag bolts (supplied by others). Sheet metal (supplied by others) may be required. *See Page 77, Figure 33* for the three-way discharge head available for Models B-350 - B-3000. *See Page 78, Figure 34* for the one-way discharge head available for Models B-4000 and B-5000.

FIGURE 33: Three-Way Discharge Head (B-350 - B-3000)



Model		A	B	C	Part Number
B-350	(in)	19.00	23.75	21.00	77349.301
	(cm)	48.3	60.3	53.3	
B-650/ B-1000	(in)	22.40	24.00	19.40	77049.301
	(cm)	56.9	61.0	49.3	
B-2000	(in)	31.90	21.50	33.90	77249.201
	(cm)	81.0	54.6	86.1	
B-3000	(in)	36.90	22.50	36.90	77549.201
	(cm)	93.7	57.2	93.7	

FIGURE 34: One-Way Discharge Head (B-4000 - B-5000)



Model		A	B	C	D	Part Number
B-4000	(in)	87.75	39.8	30	2.0	80300
	(cm)	222.9	101.1	76.2	5.1	
B-5000	(in)	103.75	48.5	30	2.0	80301
	(cm)	263.5	123.2	76.2	5.1	

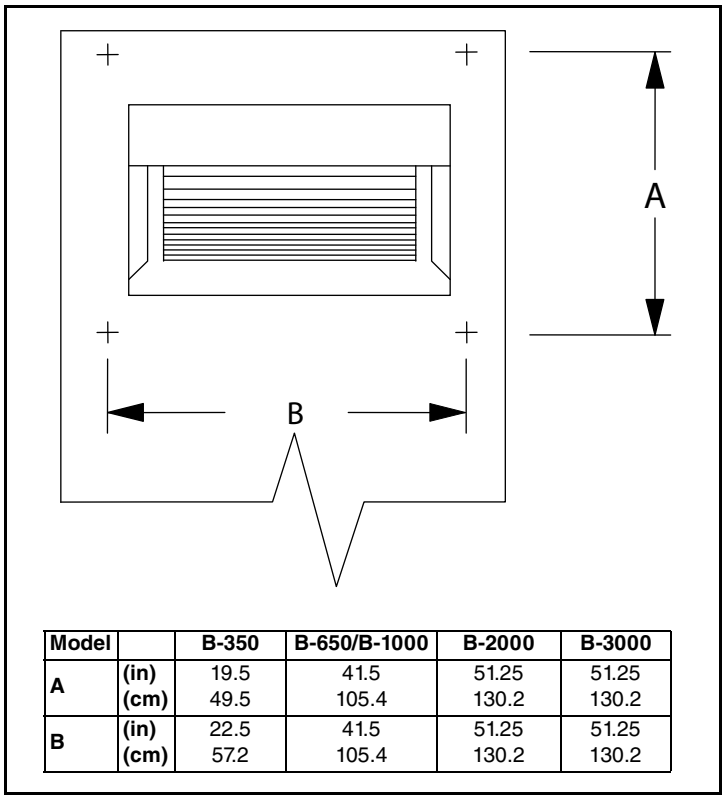
14.2 Splash Plate Installation

Model	Splash Plate Part Number
B-350	77354.301[w]
B-650/B-1000	77053.301[w]
B-2000	77253.301[w]
B-3000	77253.301[w]
B-4000	80302
B-5000	80302

The splash plate is designed to hang directly from a horizontal air handler with a bottom discharge. Before the splash plate can be installed on the air handler, first drill four holes (B-350 - B-3000) or six holes (B-4000 and B-5000) in the air handler floor. These holes should be approximately 5/8"(15.9 mm) in diameter to accommodate 1/2" hanger rods (supplied by others). These holes should be located as shown in the diagram on *Page 79, Figure 35*.

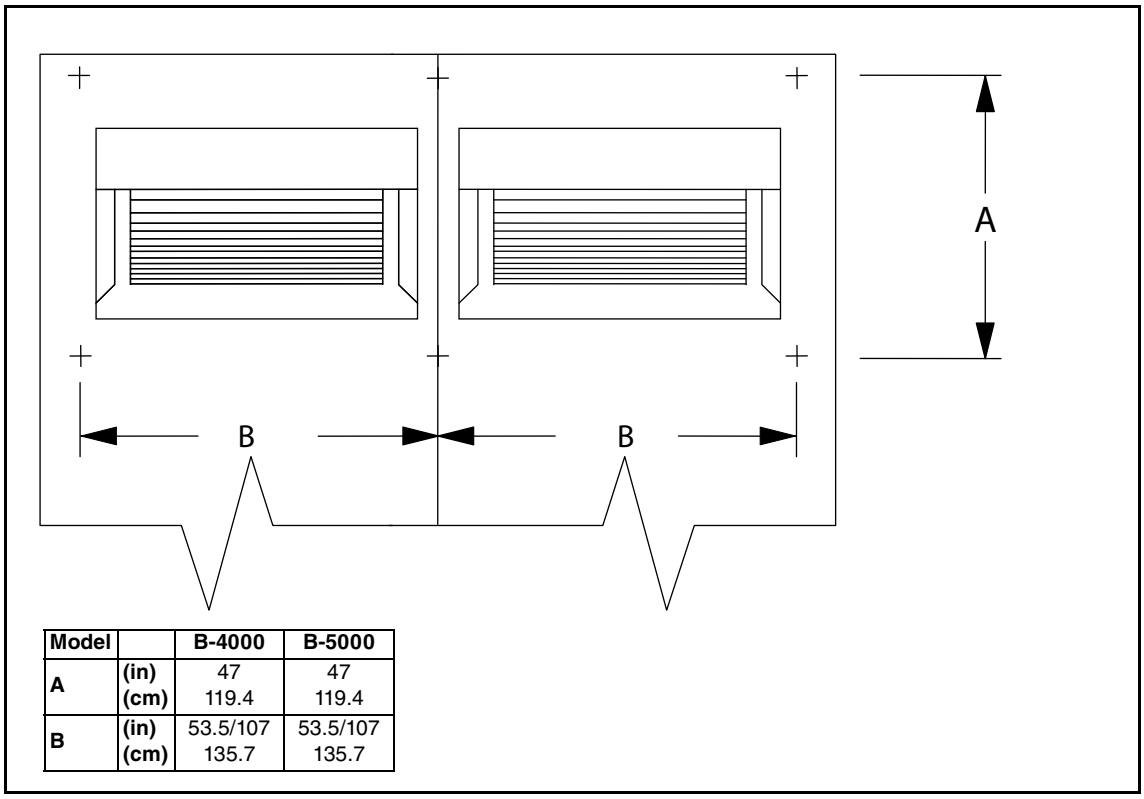
To attach all of the hanger rods to the splash plate, start by threading a flanged nut onto each hanger rod. Then, slip each hanger rod down through a hole located in each corner of the splash plate. Next, feed a flanged nut onto the rod below the splash plate (For models B-350 - B-3000, *See Page 80, Figure 37*. For models B-4000 and B-5000, *See Page 80, Figure 38*). The hanger rods should be attached to the air handler in the same manner as the splash plate, with a flanged nut on both sides of the air handler floor. Adjusting the nuts will level the splash plate. Torque hardware after leveling.

FIGURE 35: Hole Location (B-350 - B-3000)



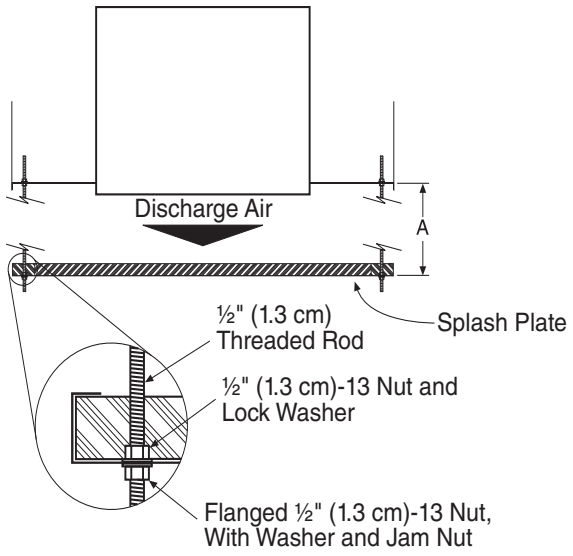
Model		B-350	B-650/B-1000	B-2000	B-3000
A	(in)	19.5	41.5	51.25	51.25
	(cm)	49.5	105.4	130.2	130.2
B	(in)	22.5	41.5	51.25	51.25
	(cm)	57.2	105.4	130.2	130.2

FIGURE 36: Hole Location (B-4000 and B-5000)



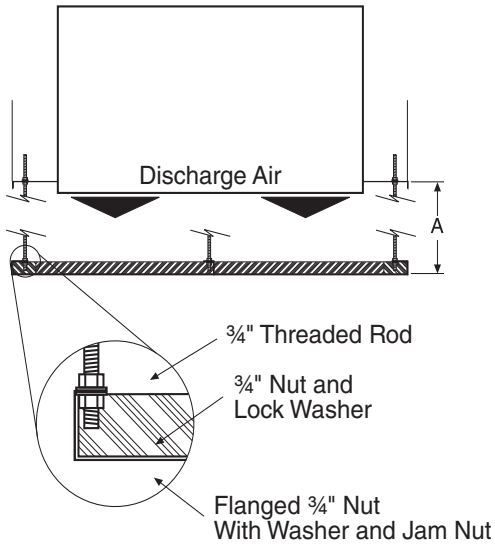
Model		B-4000	B-5000
A	(in)	47	47
	(cm)	119.4	119.4
B	(in)	53.5/107	53.5/107
	(cm)	135.7	135.7

FIGURE 37: Splash Plate Installation (B-350 - B-3000)



A		B-350	B-650/ B-1000	B-2000	B-3000
Min.	(in)	15	18	25	30
	(cm)	38.1	45.7	63.5	76.2
Max.	(in)	20	27	38	45
	(cm)	50.8	68.6	96.5	114.3

FIGURE 38: Splash Plate Installation (B-4000 and B-5000)



A		B-4000 and B-5000
Min.	(in)	25
	(cm)	63.5
Max.	(in)	38
	(cm)	96.5

SECTION 15: DUCT CONSIDERATIONS

The air handlers and their blowers are supplied as a standard to be capable of 1.0 in wc of external static pressure (ESP), except models B-1000 above 12,000 CFM and B-2000 above 35,000 CFM. Refer to the air handler's rating plate for the rated ESP. Keep in mind that any accessories added to the air stream or ducting will add to the external static resistance and reduce the available static pressure. System duct work must comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards and available ESP of the air handler for maximum blower performance.

15.1 Inlet Duct Work

Inlet duct work height and width must be no smaller than the air handler inlet height and width and supply only fresh air to the air handler. (*See Page 10, Section 5* for inlet dimensions). Inlet duct work should be straight and elbows should be minimal; any transitions should be smooth. Refer to SMACNA guidelines for further information.

15.2 Discharge Duct Work

Discharge duct work sizes should be determined by the application requirements of the system. Refer to *Page 81, Table 11* for minimum discharge duct sizes by model. Refer to SMACNA guidelines for further information. For accessory pressure drops, refer to *Page 17, Table 9*.

Table 11: Minimum Discharge Duct Connection Size

Model		Height	Width
B-350	**(in)** **(cm)**	14 35.6	15.6 39.7
B-650 / B-1000	**(in)** **(cm)**	24 61.0	24 61.0
B-2000	**(in)** **(cm)**	32 81.3	32 81.3
B-3000	**(in)** **(cm)**	38 96.5	38 96.5
B-4000	**(in)** **(cm)**	32 81.3	88 223.5
B-5000	**(in)** **(cm)**	38 96.5	104 264.2

SECTION 16: GAS PIPING

⚠WARNING

Explosion Hazard

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with air handler connected.

Failure to follow these instructions can result in death, injury or property damage.

16.1 Gas Manifolds

All gas piping to the air handler must comply with:

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

The air handlers are available with three gas manifold options.

- American National Standards Institute (ANSI) compliant manifold: (*See Page 83, Figure 39* for B-350. *See Page 83, Figure 40* for B-650 - B-3000. *See Page 85, Figure 43* for B-4000 and B-5000).
- Factory Mutual (FM)-compliant manifold: (*See Page 83, Figure 39* for B-350. *See Page 84, Figure 41* for B-650 - B-3000. *See Page 85, Figure 44* for B-4000 and B-5000).
- XL Insurance (former IRI)-compliant manifold: (*See Page 83, Figure 39* for B-350. *See Page 84, Figure 42* for B-650 - B-3000. *See Page 86, Figure 45* for B-4000 and B-5000).

16.2 Gas Piping and Pressures

The air handler is equipped with a gas manifold suitable for connection to supply pressure of up to:

- 14 in wc maximum (B-350 - B-3000 with ANSI-compliant manifold.)
- 5 p.s.i. maximum (All B-4000 and B-5000 manifolds; B-350 - B-3000 with FM or XL Insurance-compliant manifold).

When gas supply exceeds the above-listed maximum gas pressures, an additional high pressure gas regulator will be required to assure that the correct gas pressure is supplied to the regulator. Pressure should be measured between the high pressure gas regulator and safety shut off valve.

Minimum gas pressure as indicated on data plate must be measured with the burner operating in high fire.

Table 12: Gas Manifold Size

Model	B-350	B-650	B-1000	B-2000	B-3000	B-4000	B-5000
Gas NPT Connection	¾"	1"	1¼"	1½"	2"	*1½" - 3"	

**Refer to unit rating plate*

NOTE: Vent valves fitted on XL Insurance-compliant manifolds must be piped to the atmosphere in accordance with applicable codes.

FIGURE 39: ANSI/FM/XL-Compliant Manifolds (B-350)

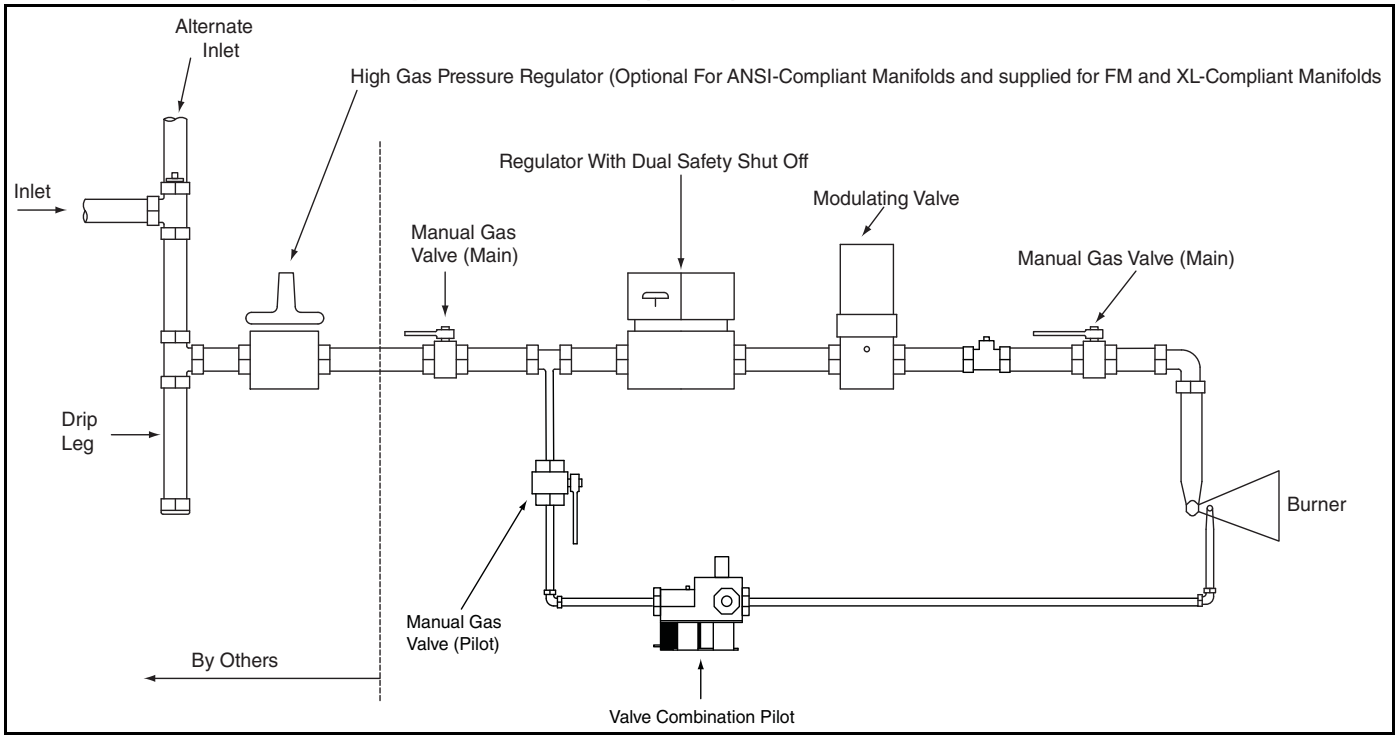


FIGURE 40: ANSI-Compliant Manifold (B-650 - B-3000)

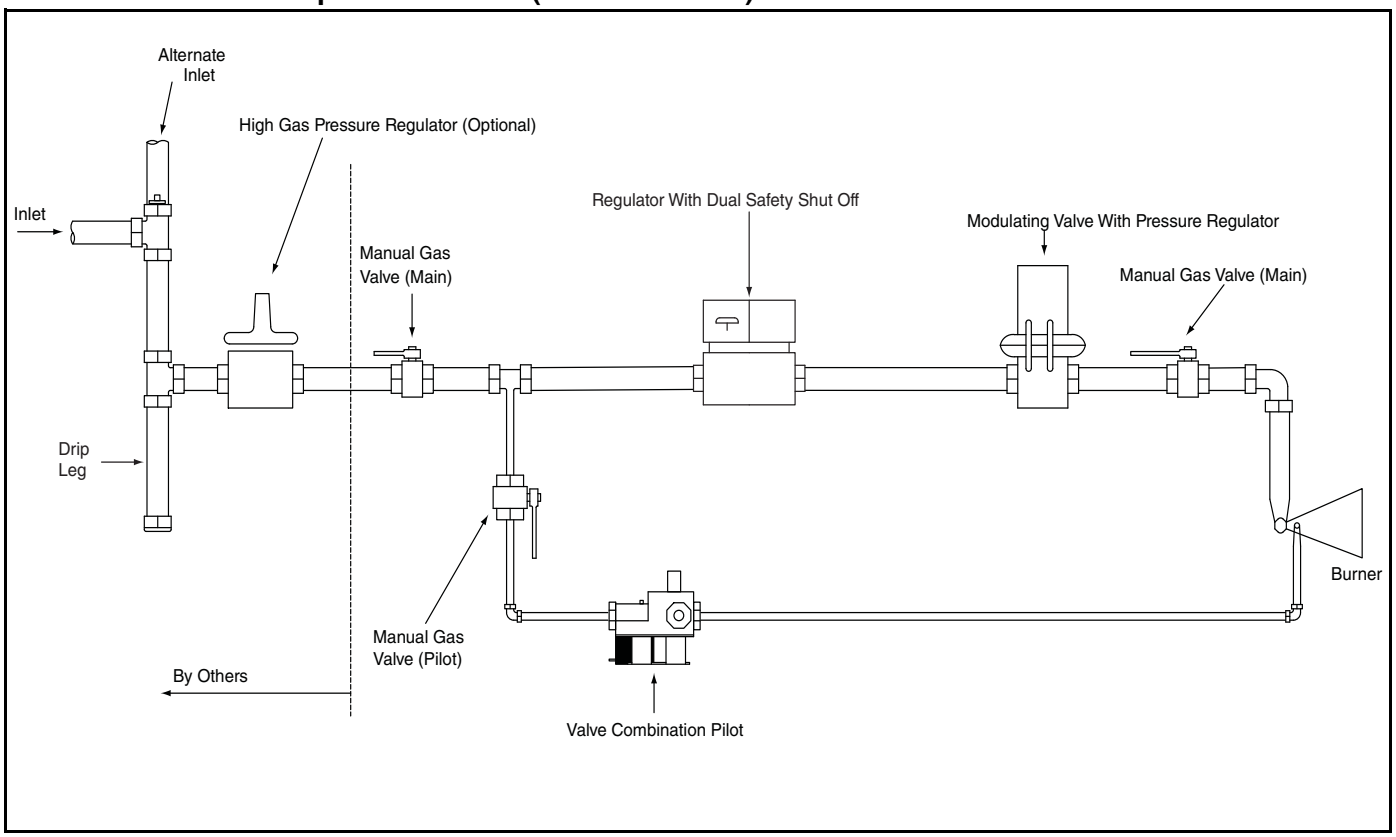
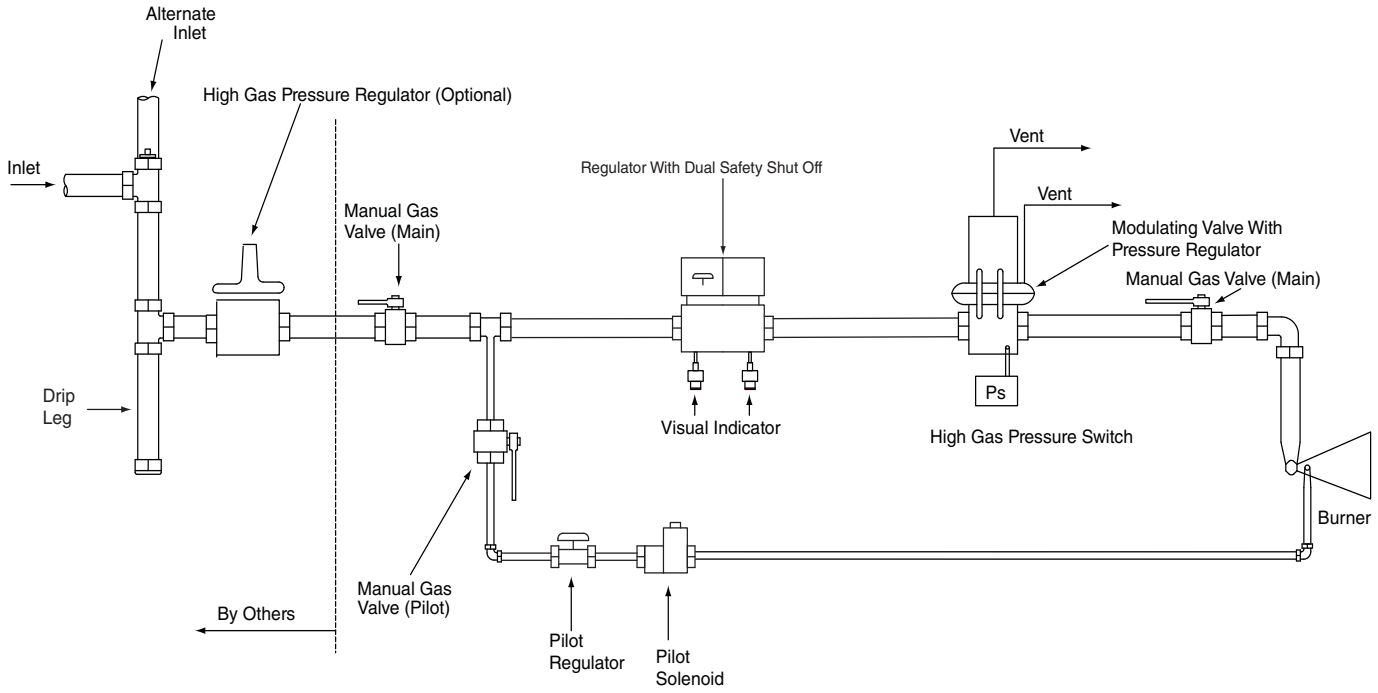
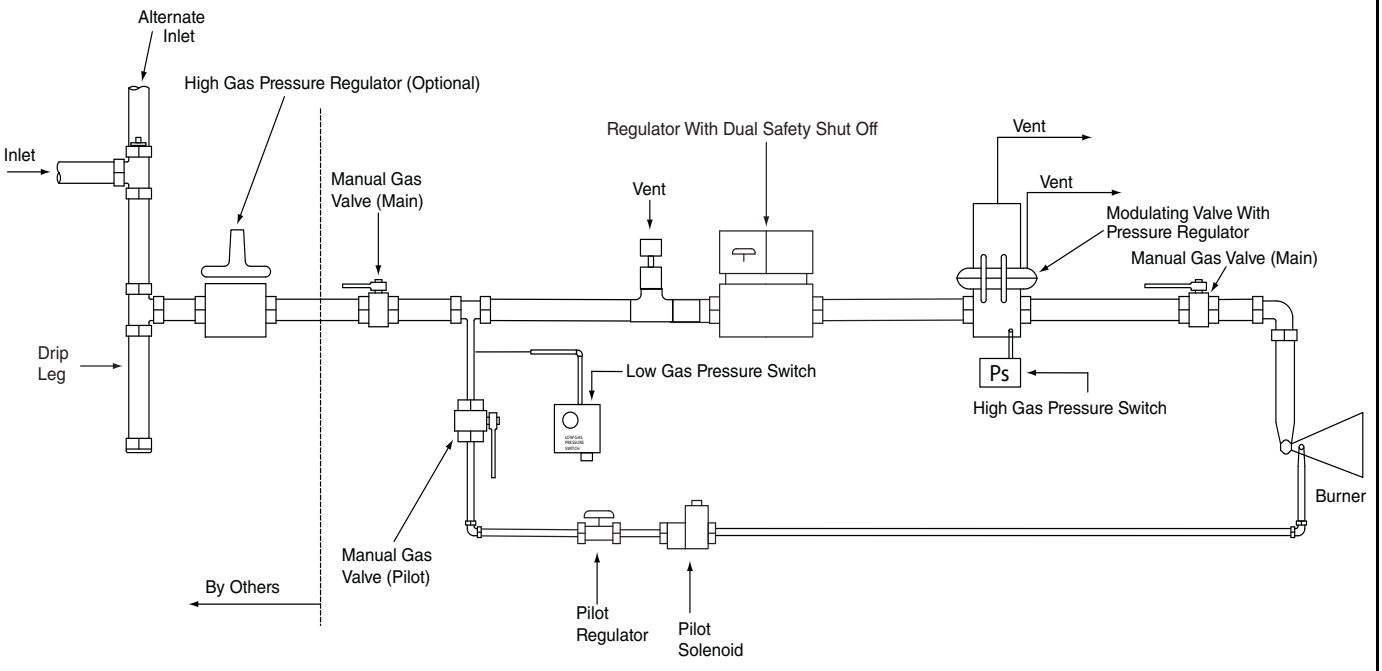


FIGURE 41: FM-Compliant Manifold (B-650 - B-3000)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 42: XL Insurance (Former IRI)-Compliant Manifold (B-650 - B-3000)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 43: ANSI-Compliant Manifold (B-4000 and B-5000)

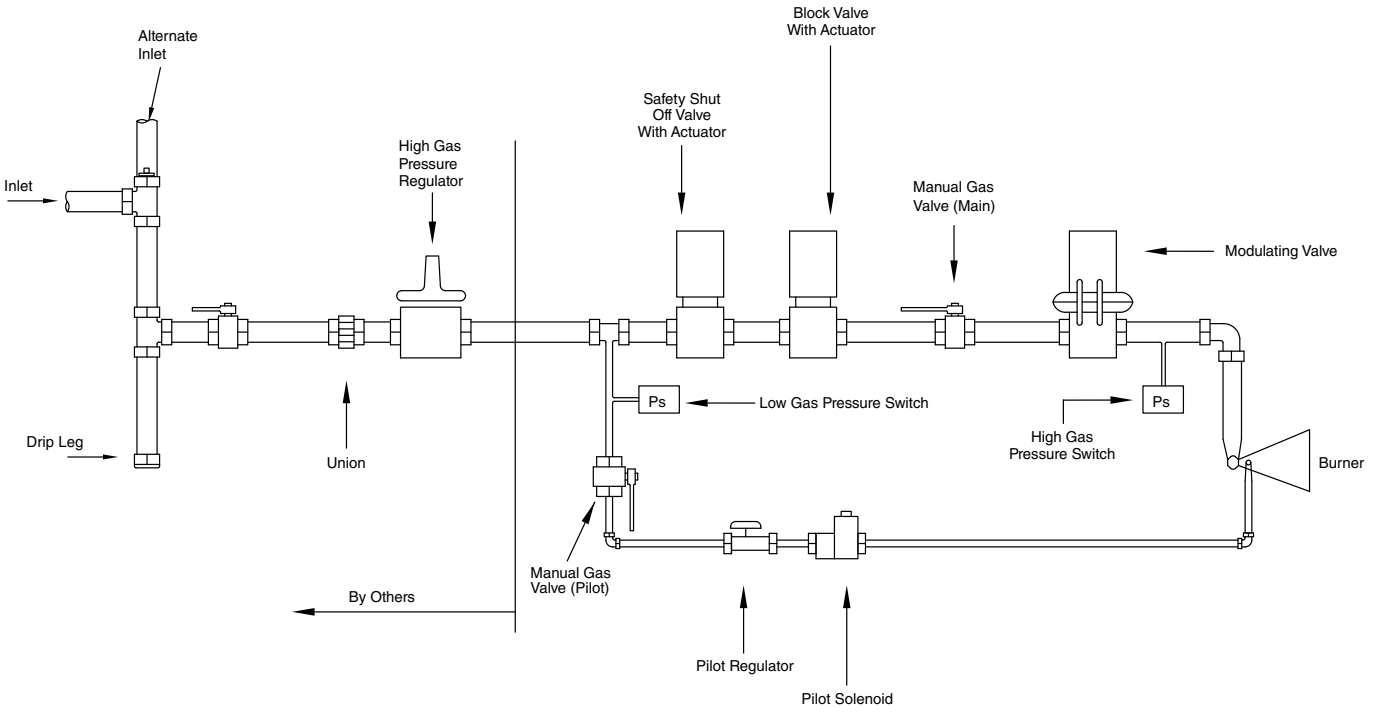
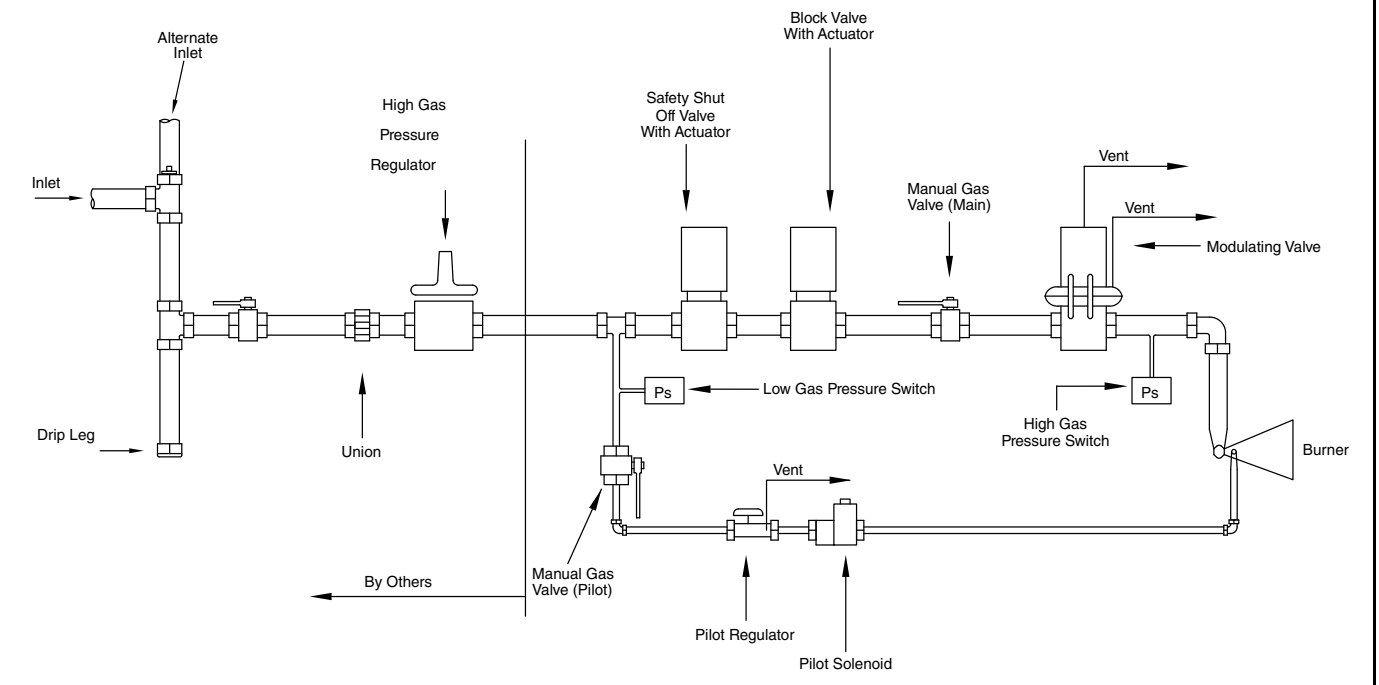
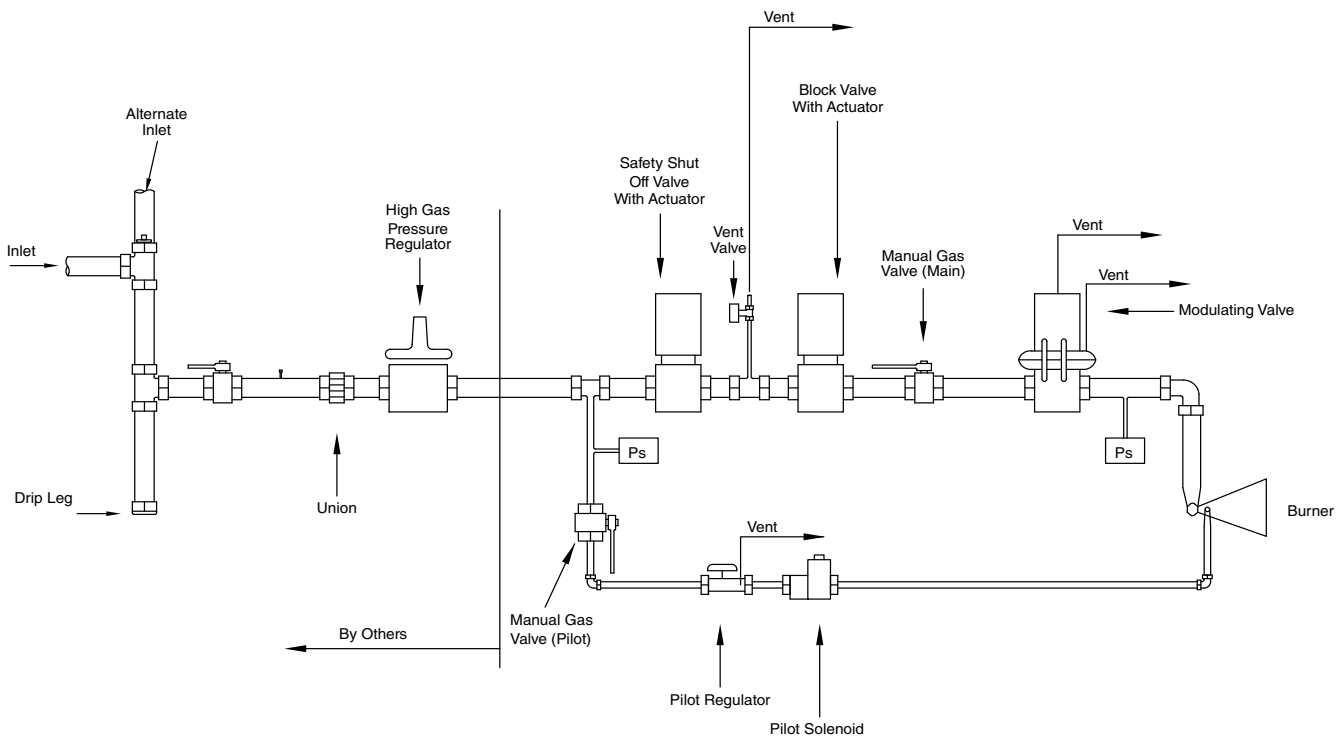


FIGURE 44: FM-Compliant Manifold (B-4000 and B-5000)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 45: XL Insurance (Former IRI)-Compliant Manifold (B-4000 and B-5000)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

16.3 Gas Piping

The gas manifold extends through the side of the control cabinet. The factory piping terminates with a female pipe connection in the manual gas valve. Be sure that the fuel supply pipe connected at this point is large enough to ensure the proper gas flow and line pressure at the inlet of the air handler. The piping must comply with:

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

Gas supply piping must conform to best building practices and local codes. During installation of the gas piping, be sure that piping does not restrict accessibility to the air handler or its removable access doors.

Lockable manual shut-off valve must be added by the installer in compliance with Occupational Safety and Health Administration (OSHA) regulations.

16.4 Pressure Test Ports

There are 1/8"(3.2 mm) and 1/4"(6.4 mm) pressure test ports located on the manifold. The test ports are available to measure the manifold inlet gas pressure and the burner gas pressure during burner setup.

16.4.1 Manifold Inlet Gas Pressure

The pressure test port for measuring manifold inlet pressure is located on the inlet side of the first safety shutoff valve. Refer to the unit rating plate for the acceptable inlet gas pressure.

16.4.2 Burner Gas Pressure

A pressure tap is used to measure negative airflow at the burner and to set high fire gas pressure. On air handlers equipped with a M611 modulating valve (Model B-350), the pressure tap is located on a tee between the M611 valve and the burner. *See Page 87, Figure 46*. On air handlers equipped with the MR212 modulating valve (Models B-650 - B-5000), the pressure tap could be located on the downstream side of the MR212 valve, on a T-fitting coming off the outlet pressure tap on the MR212 valve or between the MR212 valve and the burner. *See Page 87, Figure 47* and *Page 122, Figure 72*.

FIGURE 46: Plug Tapping (B-350)

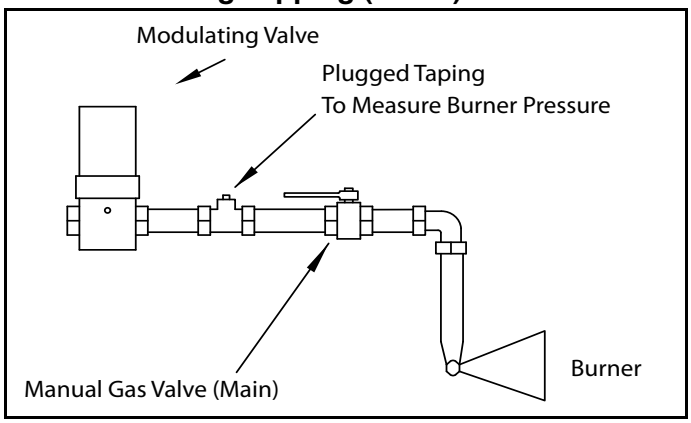
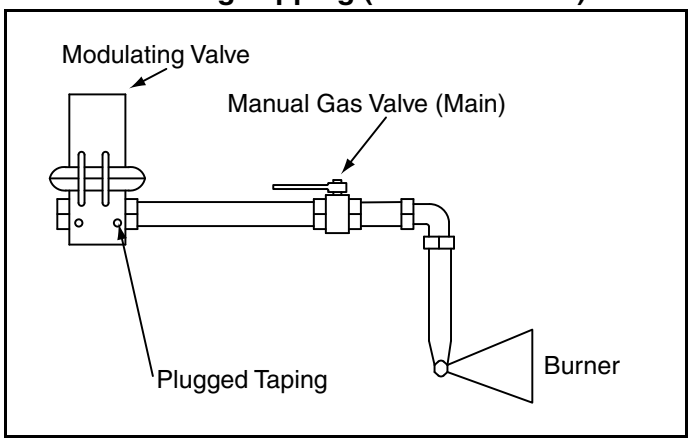


FIGURE 47: Plug Tapping (B-650 - B-5000)



16.5 Line Pressure Test - Leak Testing

The air handler and its individual shut-off valve must be disconnected from the gas supply piping systems during any pressure testing of that system at test pressures in excess of 14 in wc. The air handler must be isolated from the gas supply piping system by closing its individual manual gas valve that is located immediately upstream of the safety shut-off gas valve.

SECTION 17: ELECTRICAL

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

Each air handler is equipped with a wiring diagram which will vary depending on the type of remote panel supplied (See *Page 90 through Page 96*, *Figure 48 through Figure 54*). Depending on the air handler configuration and optional equipment ordered, an option sheet may also be included. This option sheet overwrites the wiring diagram between the electrical terminals indicated.

Air handlers can also be supplied as building management system (BMS)-ready. In this case, a remote panel is not supplied. See wiring diagrams (on *Page 97 and Page 98*, *Figure 55 and Figure 56*).

Note: Spark testing or shorting of the control wires by any means will render the transformers inoperative.

17.1 Wiring and Electrical Connections

All electrical wiring and connections, including electrical grounding, must comply with:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

Check rating plate on air handler for supply voltage and current requirements.

If any of the original control wire supplied with the air handler must be replaced, replace it with type MTW 105°C, 600 V, 16 gauge wire or equivalent, except for temperature control wiring, which must be a minimum of 20 AWG Type Beldon 5401FE CMR 75C shielded or equivalent.

For all other wires, replace with the equivalent size and type of wire that was originally provided with the air handler.

17.2 Remote Panel

The remote panel must be wired as shown on the electrical schematic. (For wire gauge sizes, *see Page 88, Table 13*). All power supply and motor wiring must be minimum type THWN with a 167° F (75° C) temperature rise.

17.2.1 Remote Panel Mounting Distance

If the interconnection wiring between the remote panel and the air handler control enclosure is run in a single conduit, the wire run can be as long as 100' (30 m). If the interconnection wiring between the remote panel and the air handler control enclosure is run in two conduits (separating the shielded cable and the 120 V power supply for the remote panel), the wire run can be as long as 200' (60 m). For longer wire runs, consult the factory. Care should be used to avoid running the interconnect wiring near large industrial loads or high voltage wire runs as that may further limit the length of the interconnect wire run.

Table 13: Control Voltage Wiring For All Control Systems

Volts	Wire Gauge	Max Wire
120	18	150’ (45 m)
120	16	250’ (75 m)
120	14	350’ (106 m)

NOTE: Wiring for temperature controls must be run in shielded cable as indicated on the wiring diagram.

17.3 Motor Current Draw

For current requirements of the motor, refer to *Page 89, Table 14*. For specific current requirements, see rating plate located on the blower motor. Current draw may be adjusted downward by reducing blower rotations per minute (RPM) or by increasing external static pressure.

17.4 Control Current Draw

The maximum current draw for an air handler’s controls and accessories is 3A.

17.5 Safety Systems

Safety systems are required for proper performance of the air handler. The air handler shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and service of gas fired heating

equipment, using only components that are sold and supplied by Bananza. Refer to *Page 89, Table 15* for a brief description of each safety device, its location and its switching voltage.

Table 14: Full Load Current Draw

Electrical Characteristics	Motor Size (HP)										
	2	3	5	7.5	10	15	20	25	30	40	50
230/1/60	12.0	16.0	23.0	31.0	39.0	-	-	-	-	-	-
208/3/60	5.9	8.7	14.0	21.7	29.0	41.0	50.0	65.0	77.0	104	130
230/3/60	5.6	8.0	13.8	20.0	26.8	38.0	48.0	60.0	72.0	95	121
460/3/60	2.8	4.0	6.9	10.0	13.4	19.0	24.0	30.0	36.0	47.5	60.5
575/3/60	2.2	3.1	5.5	7.7	10.0	16.2	19.2	24.5	29.6	38.8	49.2

Table 15: Safety Systems

Safety Controls	Location	Voltage
Manual Reset High-Temp Limit (All Models)	Blower Discharge	120
Pressure Switches (All Models)	Air Handler Control Enclosure	120
Flame Control (B-650/B-1000/B-2000/B-3000/B-4000/B-5000)	Air Handler Control Enclosure	120
Flame Control (B-350)	Air Handler Control Enclosure	24
Discharge Temperature Monitor (All Models)	Blower Discharge	24

17.5.1 Manual Reset High Temperature Limit Switch

If for any reason, the temperature of the air at the discharge of the blower reaches the limit set point of 160° F (71.1° C) for Models B-350 - B-3000 or 150° F (65.6° C) for Models B-4000 and B-5000, the high temperature limit switch will open the circuit to the burner system and discontinue all burner functions. Events that could result in excessive discharge air temperatures include if the burner modulation amplifier is defective (i.e. temperature sensor goes open circuit) or if a surge in gas pressure reaches the burner. Restarting of the burner can only be accomplished after the limit has cooled down and the reset button on the switch has been depressed. This switch is located on the blower housing inside the air handler.

17.5.2 Pressure Switches

The low airflow velocity pressure switch monitors the airflow (differential pressure) across the burner. When the airflow across the burner reaches the proper velocity (volume) for combustion, the switch closes. When the switch closes, it permits the flame safeguard relay to begin ignition. This switch is factory set at 0.32 in wc. The high velocity pressure switch will open if the airflow across the burner reaches its maximum allowable limit. This switch is factory set at 1.40 in wc. The pressure switch is a safety device, which cannot be field-adjusted or tampered with.

17.5.3 Flame Control

This device will check for both pilot flame and main flame within the burner. When a flame signal (5.0 VDC) from the pilot flame is available, it will allow the main gas valve to open.

Models B-350 - B-1000 operate with intermittent pilot (pilot stays lit during burner operation). Models B-2000 - B-5000 operate with interrupted pilot (pilot turns off after flame is established). The flame sensor observes main flame only.

Model B-350 uses a flame rod to detect the flame; Models B-650 - B-5000 use an ultraviolet (UV) light scanner.

If a pilot flame is not present, the electrical signal cannot be sent and the pilot burner gas valve will close. The relay is equipped with a 10-second trial for ignition. If ignition does not occur, the flame safeguard relay will lockout, and must be manually reset. B-350 will reset upon power restoration. (See the Trouble-Shooting Guide - *Page 137, Section 22*)

17.5.4 Discharge Temperature Sensor

This device senses the discharge temperature of the air at the blower. The discharge temperature sensor reports the discharge temperature to the temperature control amplifier which modulates the burner to the temperature set on the remote panel selector. Should this system fail, the manual high temperature limit switch will turn the burner off. BMS-ready air handlers do not come equipped with this sensor and must be field-supplied.

FIGURE 48: Wiring Diagram Key

Notes:

1. Wire Over 24vac To Be A Minimum Of
   16 Awg Flexing Type Mtw, 105c, 600v Or Equivalent
   Colors 115vac: Phase-red, Neutral-white,
   Ground-green
   Colors 24vac: Blue

2. Control Wire To Be A Minimum Of 20 Awg Type
   Belden 5401fe Cmr 75c Shielded Or Equivalent

3. Power Supply And Motor Wires To Be Sized To Nfpa79,
   Latest Edition
   Colors All Voltages: Phase(s)-black, Ground-green

Terminals Located In Control Panel Only

Terminals Located In Control Panel And
Connected To The Remote Panel

Terminals Located In Remote Panel Only

Wire(s) Located In Control Panel

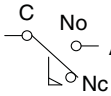
Wire(s) Located In Remote Panel

Shielded Wire(s), One End Grounded

Relay / Motor Starter Coil (Associated With M1 Contacts)

Normally Open Contact (Associated With M1 Coil)

Normally Closed Contact (Associated With CR2 Coil)



Air Flow Switch

Indicator Light On Remote Panel

FIGURE 49: Basic Remote Wiring Diagram (B-350)

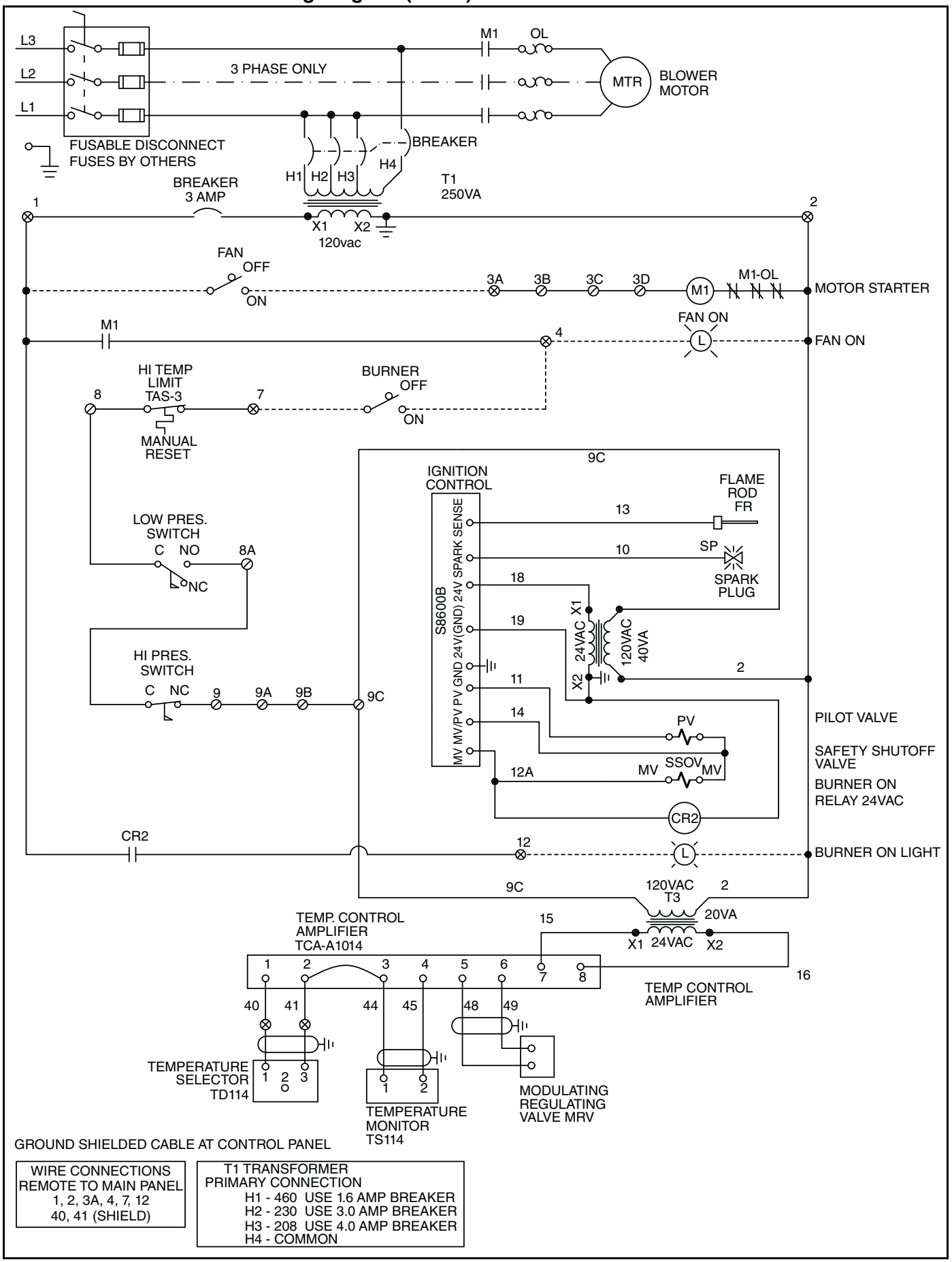


FIGURE 50: Standard Discharge Control Remote (SDC) Wiring Diagram (B-350)

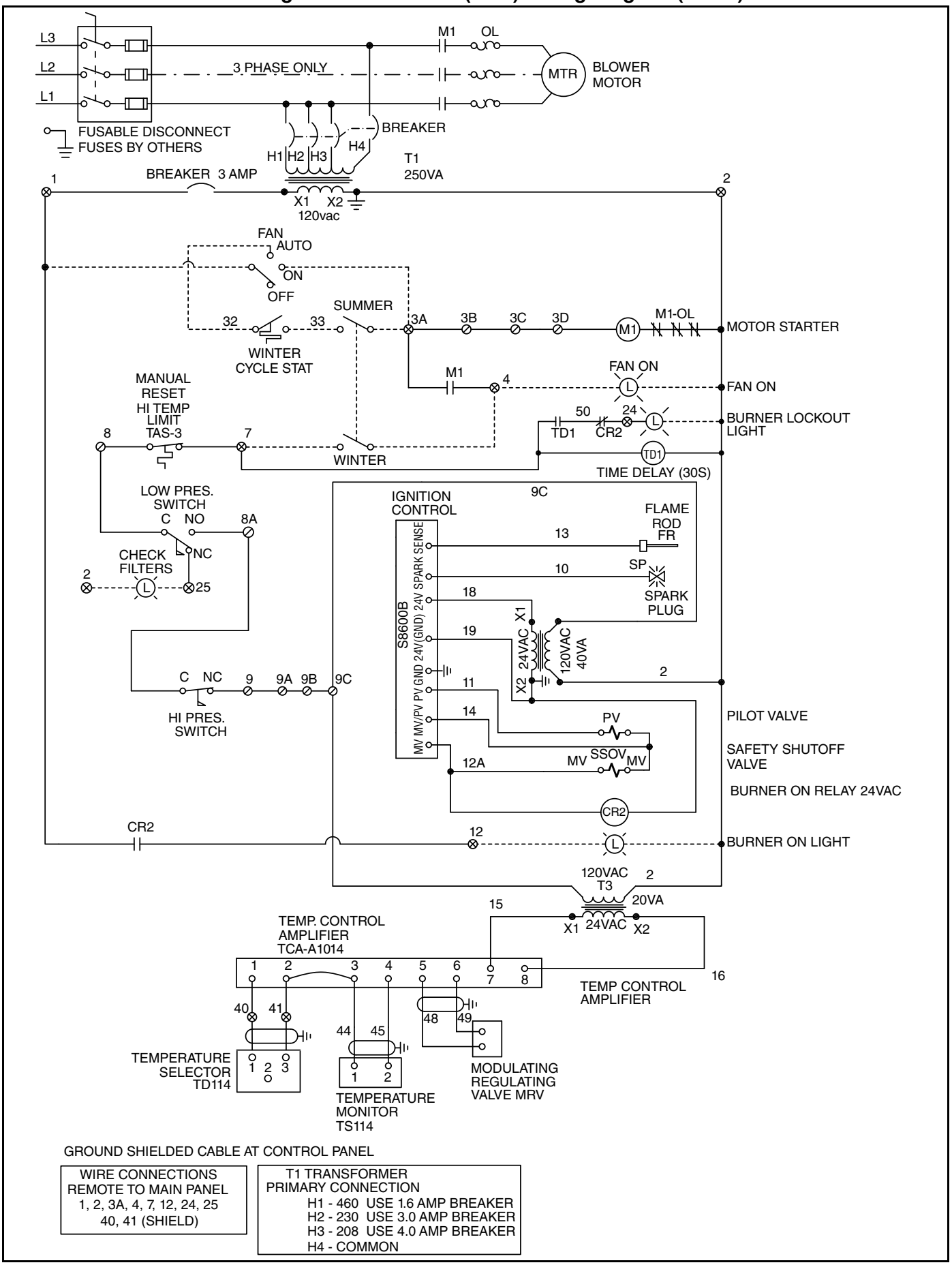


FIGURE 51: Deluxe Temperature Control Remote (DTC) Wiring Diagram (B-350)

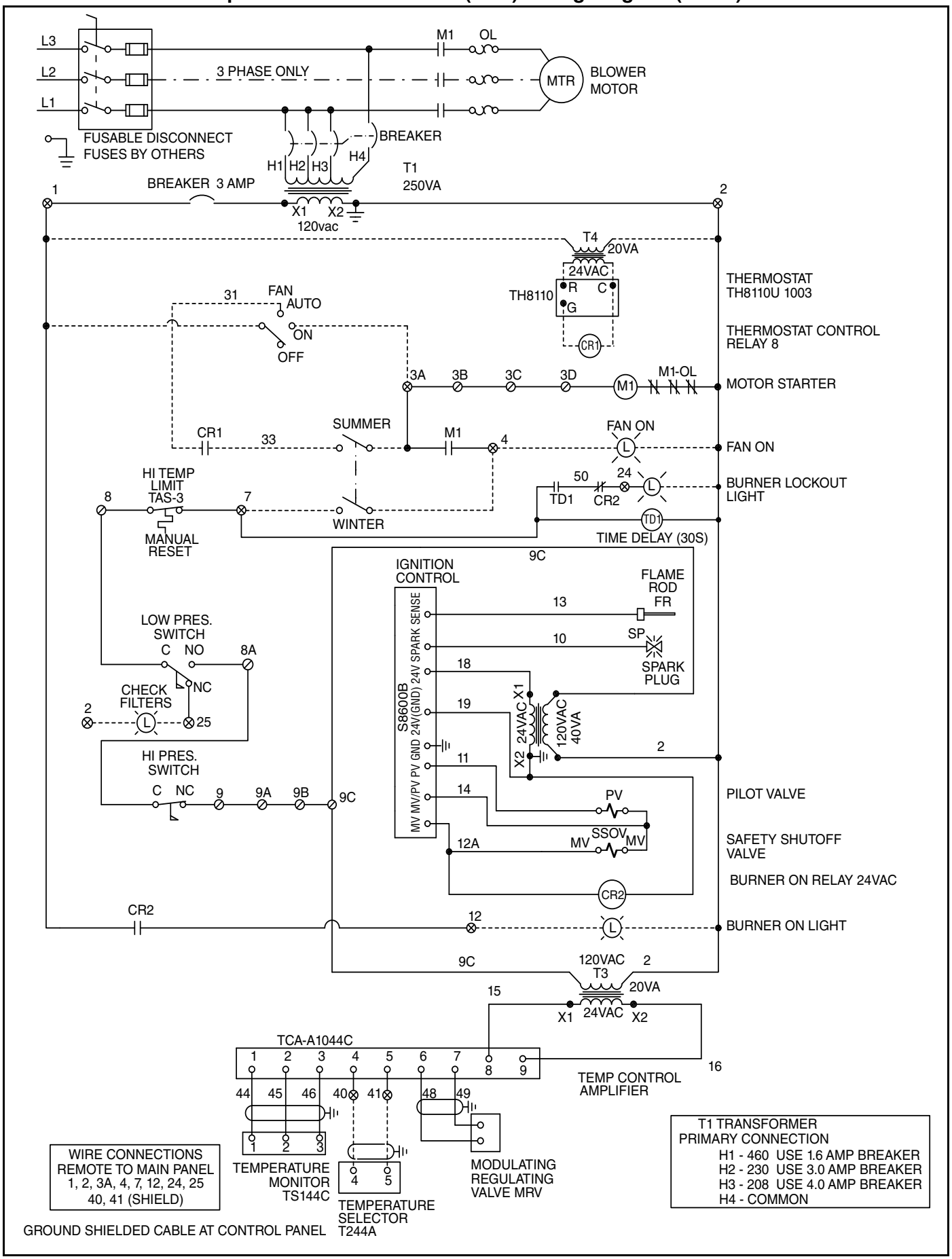


FIGURE 52: Basic Remote Wiring Diagram (B-650 - B-5000)

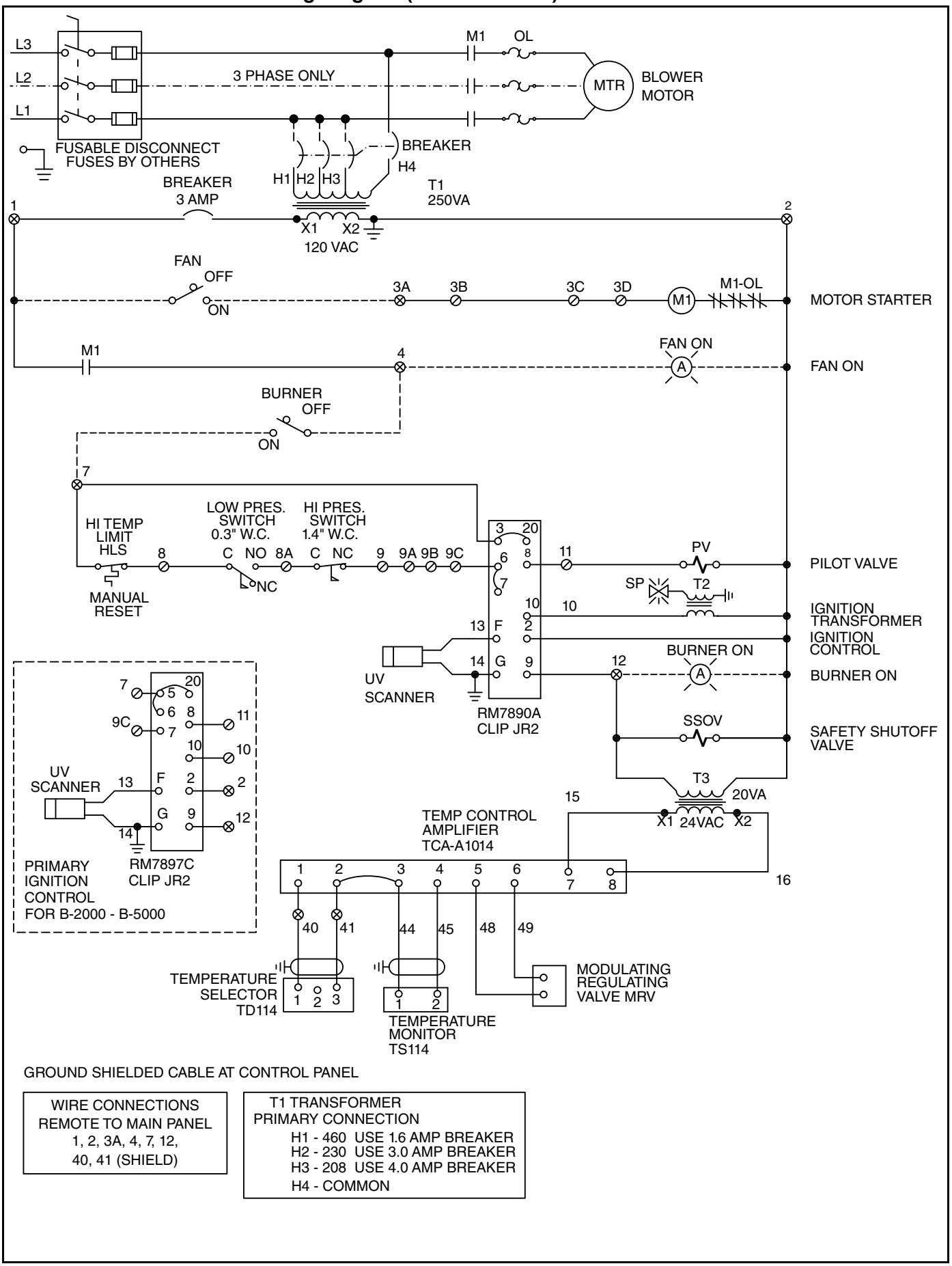


FIGURE 53: Standard Discharge Control Remote (SDC) Wiring Diagram (B-650 - B-5000)

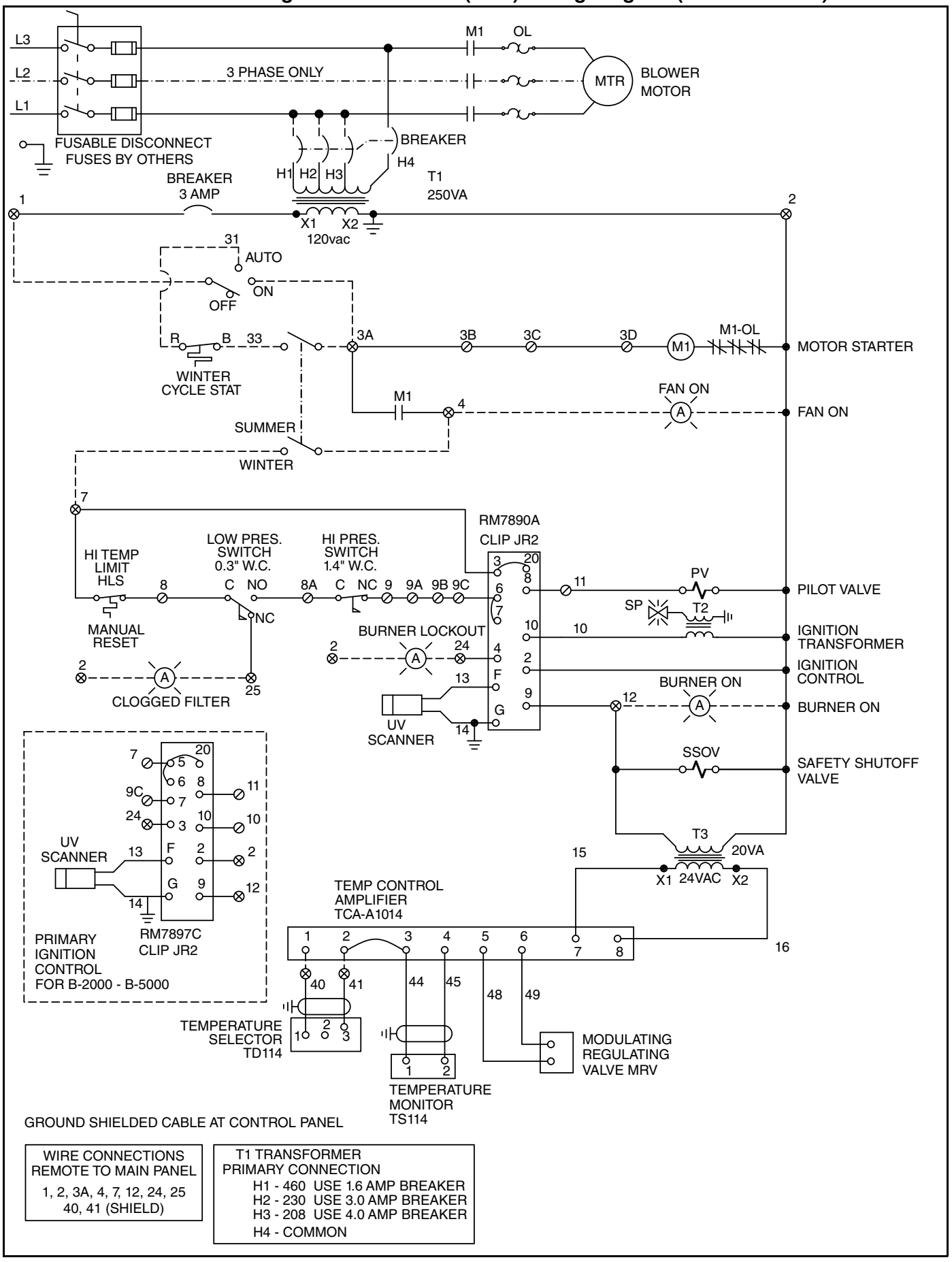


FIGURE 54: Deluxe Temperature Control Remote (DTC) Wiring Diagram (B-650 - B-5000)

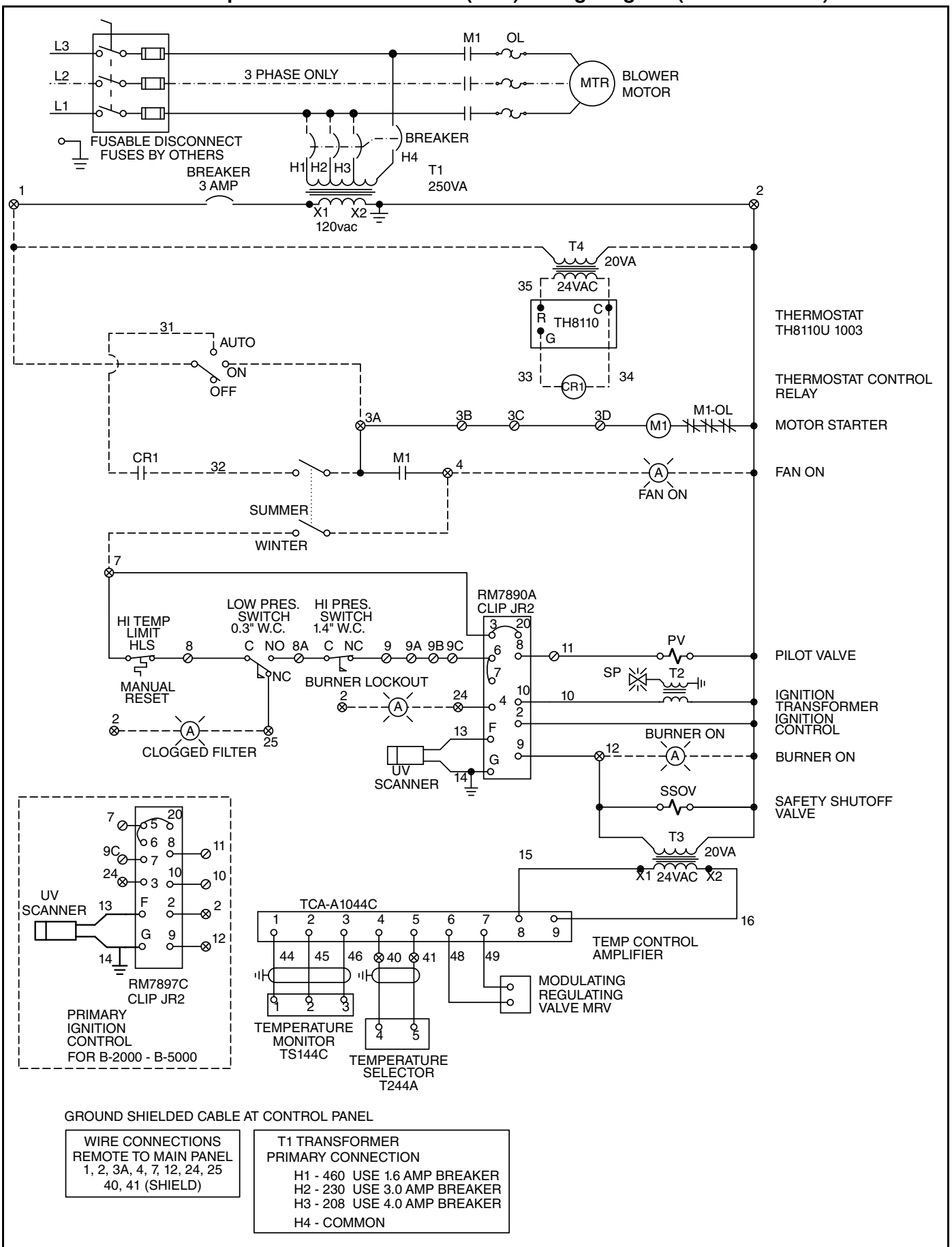


FIGURE 55: BMS-Ready Control MUA/FR Style Units (B-650 - B-5000)

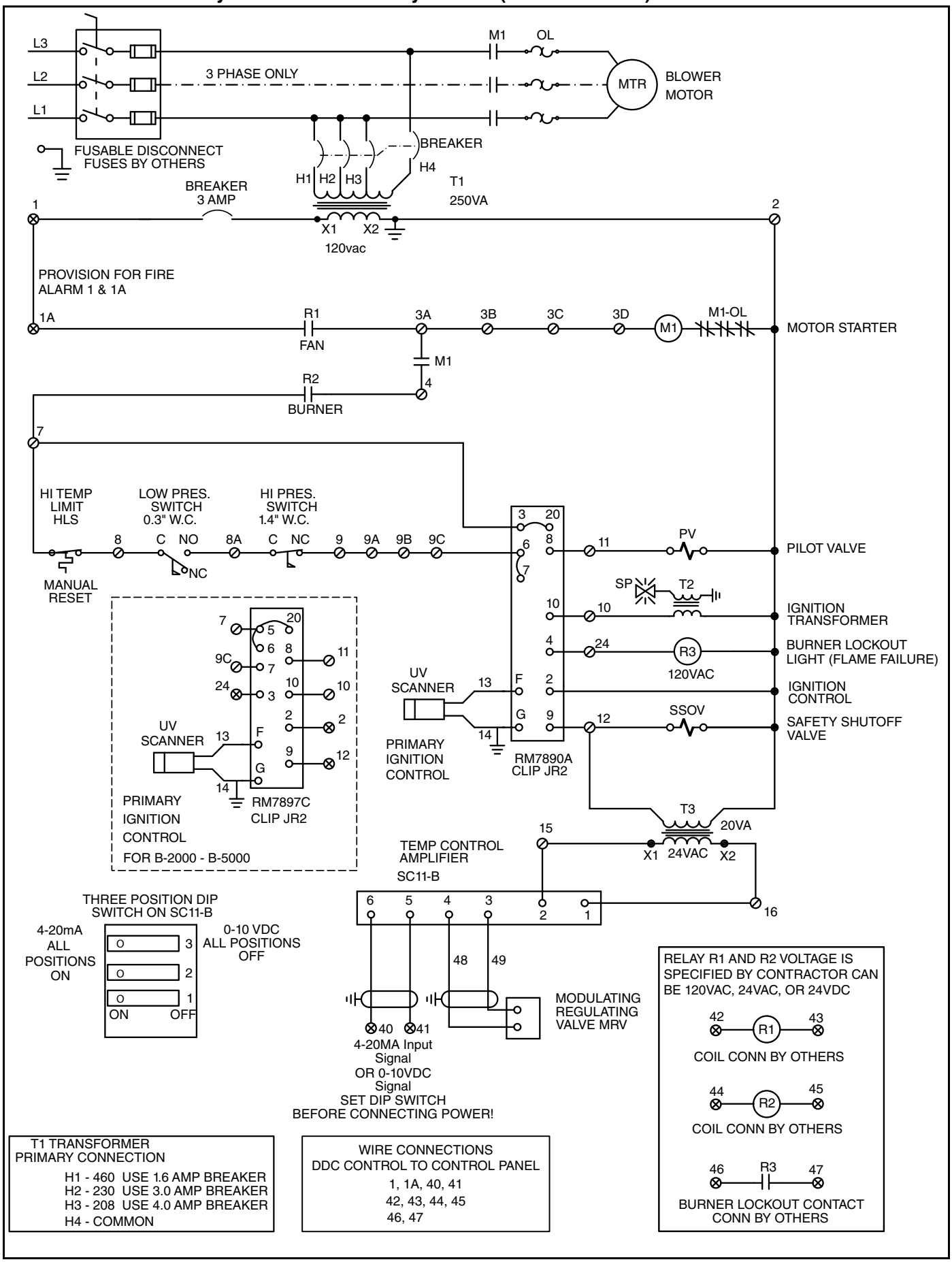
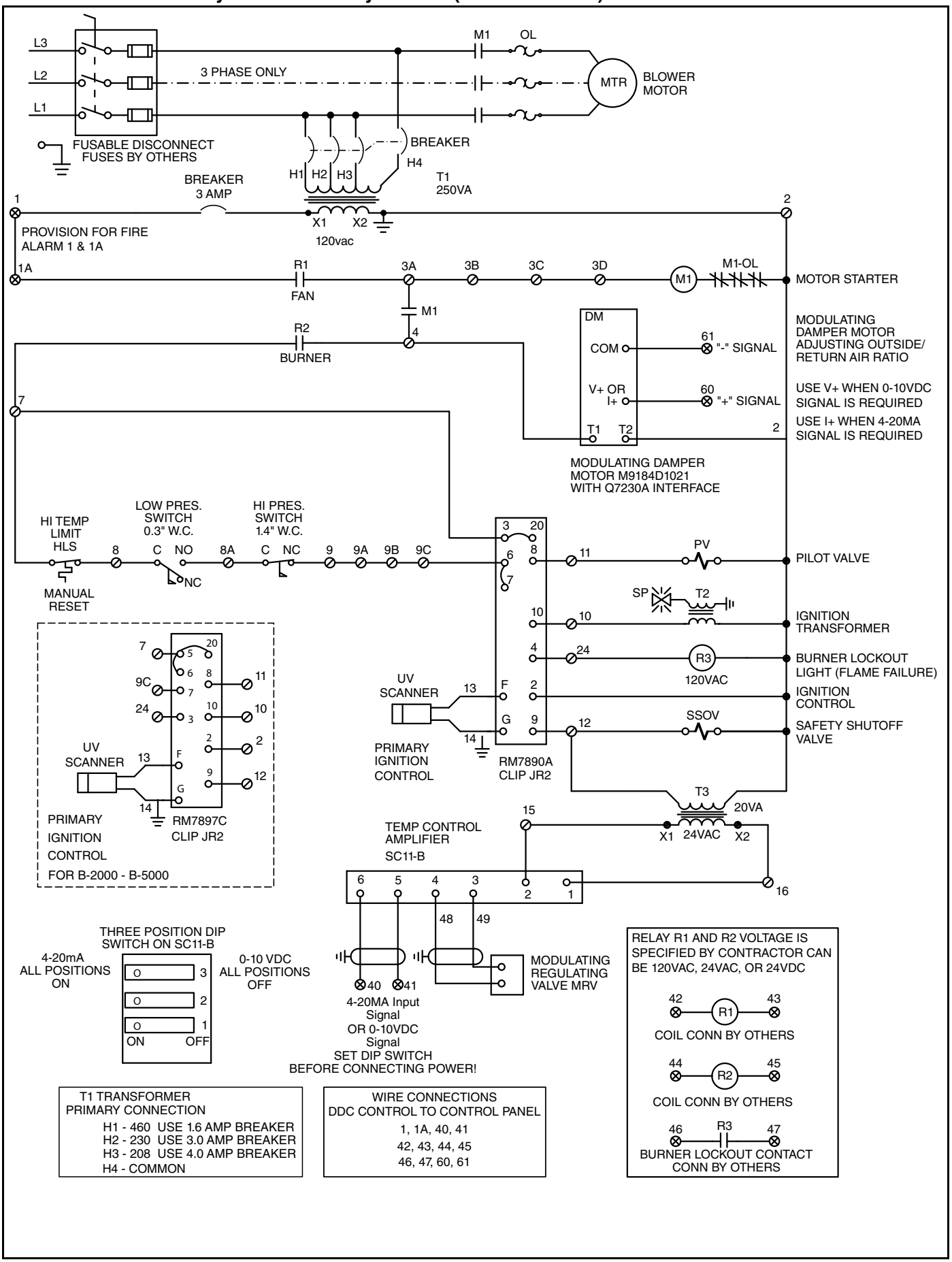


FIGURE 56: BMS-Ready Control AM Style Units (B-650 - B-1000)



17.6 Additional Control Wiring

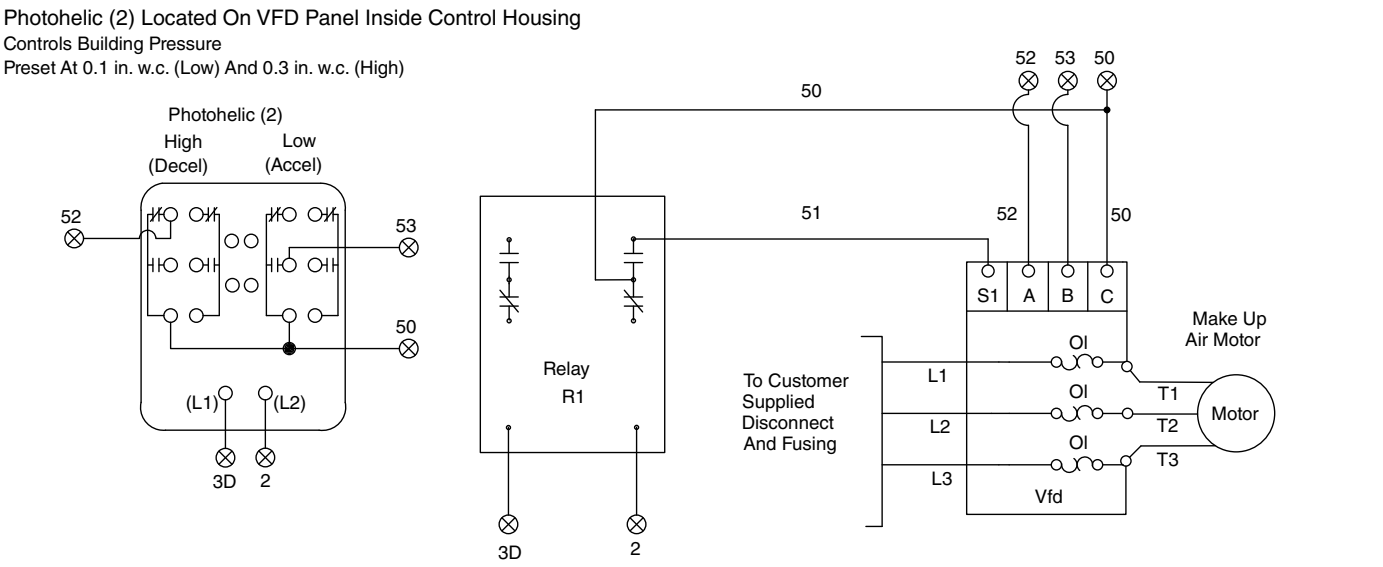
Depending on the style of the air handler (MUA, FR, AM or VAV), there may be additional control wiring that will be factory installed when the air handler is ordered. Any additional control wiring that is added to the air handler will be on the supplemental option sheet. On the MUA style, there are no additional controls unless an optional feature is added. The FR style air handler uses a fixed damper and also does not require additional control wiring unless an optional feature is added.

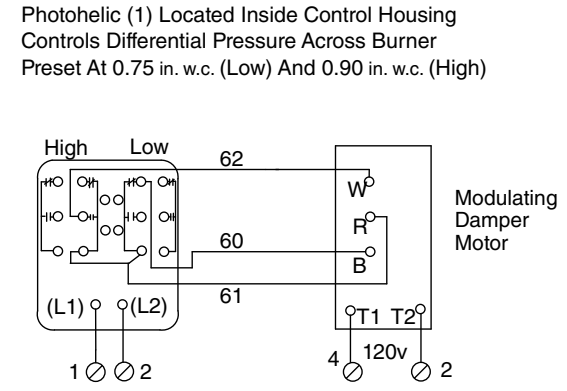
The VAV style air handler controls a floating damper and a variable frequency drive (VFD) and requires additional control wiring, *See Page 99, Figure 57* for the additional VAV style wiring for models B-650 and B-1000 and *See Page 100, Figure 58* for additional VAV style wiring for models B-2000 and B-5000.

The AM style air handler controls a floating damper and requires additional control wiring, *See Page 101, Figure 59* for the additional AM style wiring for Models B-650 and B-1000 and *See Page 101, Figure 60* for additional AM style wiring for Models B-2000 - B-5000.

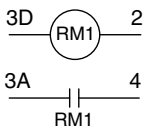
FIGURE 57: Additional Control Wiring for VAV Style (B-650 - B-1000)

VFD Terminals			
	A	B	C
Up To 25hp	S3	S4	SC
30hp And Up	S3	S5	SN





Note: Motor Starter, Overload and M1 Auxiliary Contact Is Replaced With RM1 Relay.



VFD Program Paramters 25 HP or Less

C1-01=20 Accel Time (Sec)
C1-02=20 Decel Time (Sec)
D2-02=50% Minimum Hz (50%=30 Hz)
H1-03=10, H1-04=11, H1-05=0F
H1-07=0F (V1000 Only)
L2-01=1, L5-01=5

VFD Program Paramters 30 HP or More

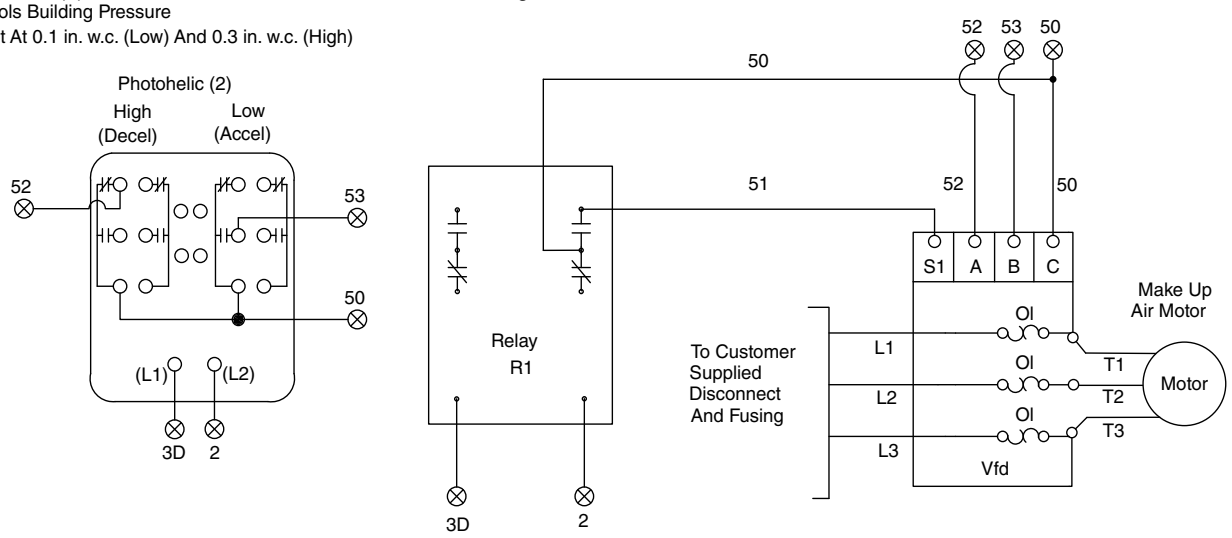
B1-02=1, C1-01=25, C1-02=25
D2-02=50, D4-01=1
E1-01=Volts, E2-01=Amp
H1-04=10, H1-05=11

Part Number	Description	Models
VAV	VAV Control Wiring	B-650 and B-1000

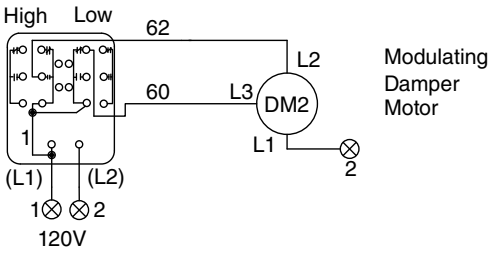
FIGURE 58: Additional Control Wiring for VAV Style (B-2000 - B-5000)

VFD Terminals			
	A	B	C
Up To 25hp	S3	S4	SC
30hp And Up	S3	S5	SN

Photohelic (2) Located On VFD Panel Inside Control Housing
Controls Building Pressure
Preset At 0.1 in. w.c. (Low) And 0.3 in. w.c. (High)

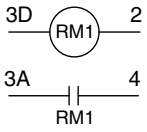


Photohelic (1) Located Inside Control Housing
Controls Differential Pressure Across Burner
Preset At 0.75 in. w.c. (Low) And 0.90 in. w.c. (High)



Modulating Damper Motor

Note: Motor Starter, Overload And M1 Auxiliary Contact Is Replaced With RM1 Relay.



VFD Program Paramters 25 HP or Less

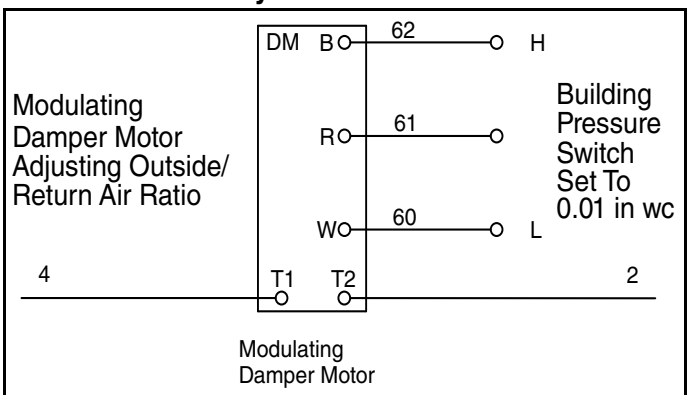
C1-01=20 Accel Time (Sec)
C1-02=20 Decel Time (Sec)
D2-02=50% Minimum Hz (50%=30 Hz)
H1-03=10, H1-04=11, H1-05=0F
H1-07=0F (V1000 Only)
L2-01=1, L5-01=5

VFD Program Paramters 30 HP or More

B1-02=1, C1-01=25, C1-02=25
D2-02=50, D4-01=1
E1-01=Volts, E2-01=Amp
H1-04=10, H1-05=11

Part Number	Description	Models
VAV	VAV Control Wiring	B-2000 - B-5000

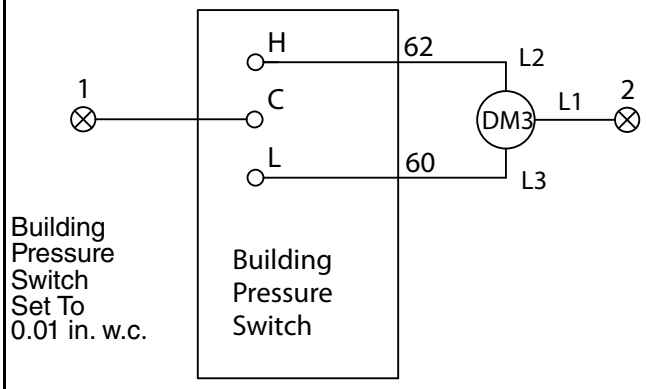
FIGURE 59: AM Style for B-650 - B-1000



Operation:
Building Pressure Increases, Damper Gradually Opens Return Air Supply Until Desired Bulding Pressure Has Been Obtained.
Building Pressure Decrease Controls Reverse

Part Number	Description	Models
AM	AM Control Wiring	B 650 and B-1000

FIGURE 60: AM Style for B-2000 - B-5000



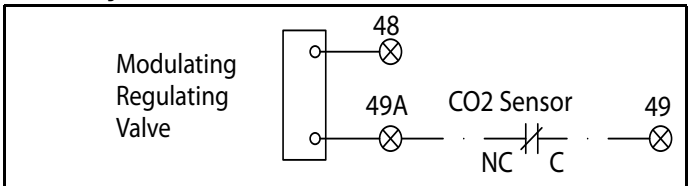
Operation:
Building Pressure Increases, Damper Gradually Opens Return Air Supply Until Desired Building Pressure Has Been Obtained. Building Pressure Decrease, Damper Gradually Closes Return Air Supply Until Desired Building Pressure Has Been Obtained.

Part Number	Description	Models
AM	AM Control Wiring	B-2000 - B-5000

17.7 Carbon Dioxide Interlocks

All air handlers that recirculate air from the heated space require either a control to limit the temperature rise in proportion to the amount of outdoor air or the use of a room carbon dioxide sensor. The carbon dioxide sensor is field provided and set to maintain a CO2 concentration below 5,000 ppm. For the additional wiring to accommodate this requirement for the FR and MUA style air handler, *See Page 101, Figure 61*. For the additonal wiring to accommodate this requirement for the AM and VAV style air handlers *See Page 101, Figure 62* for B-650 and B-1000. See *Page 102, Figure 63* for models B-2000 - B-5000.

FIGURE 61: CO2 Sensor Interlock for FR and MUA Style

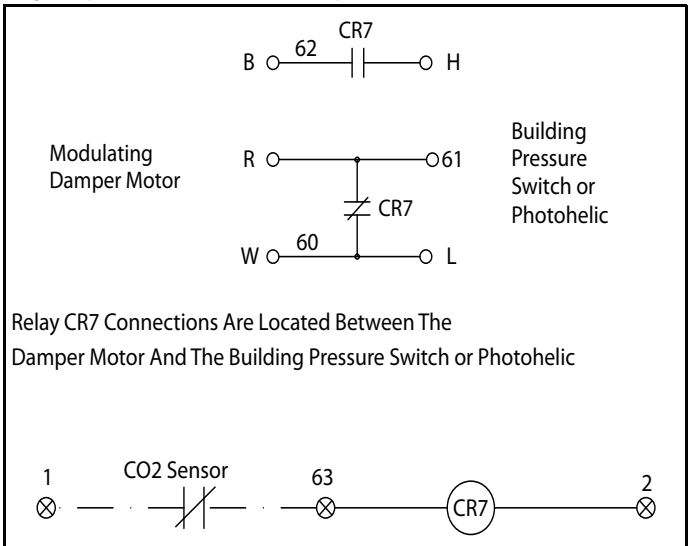


This Replaces The MRV Wiring
Located On The Main Diagram

CO2 Sensor Wiring By Others

Part Number	Description	Models
13205105	CO2 Sensor Interlock	FR and MUA

FIGURE 62: CO2 Sensor Interlock for AM and VAV Style (B-650 and B-1000)



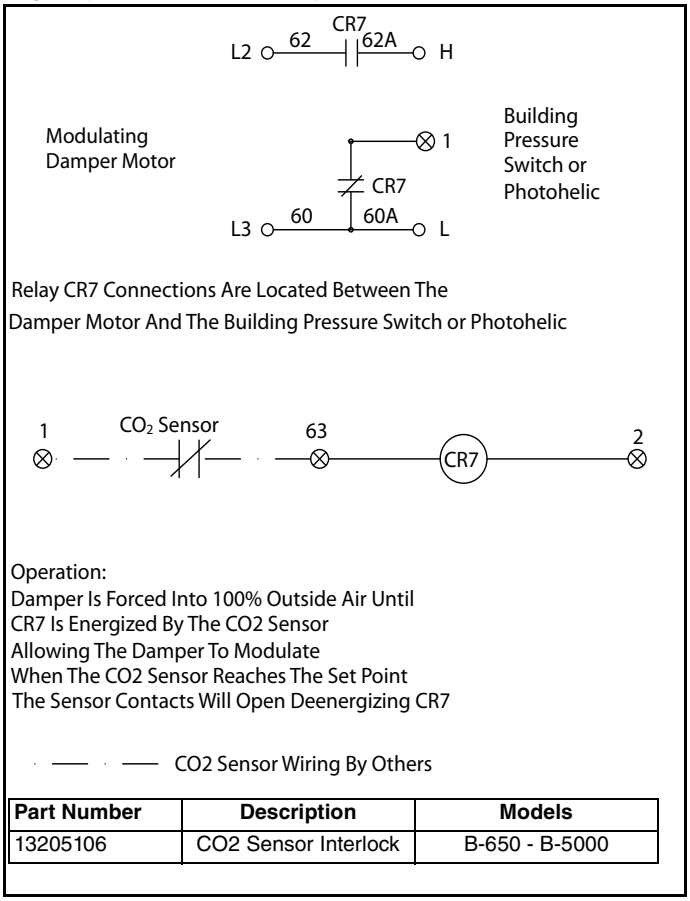
Relay CR7 Connections Are Located Between The
Damper Motor And The Building Pressure Switch or Photohelic

Operation:
Damper Is Forced Into 100% Outside Air Until
CR7 Is Energized By The CO2 Sensor
Allowing The Damper To Modulate
When The CO2 Sensor Reaches The Set Point
The Sensor Contacts Will Open Deenergizing CR7

CO2 Sensor Wiring By Others

Part Number	Description	Models
13205106	CO2 Sensor Interlock	B-650 and B-1000

FIGURE 63: CO2 Sensor Interlock for AM and VAV Style (B-2000 - B-5000)

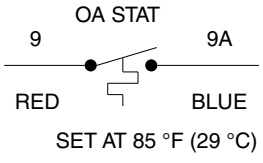


Part Number	Description	Models
13205106	CO2 Sensor Interlock	B-650 - B-5000

17.8 Control Options

17.8.1 Mild Weather Outside Air Stat

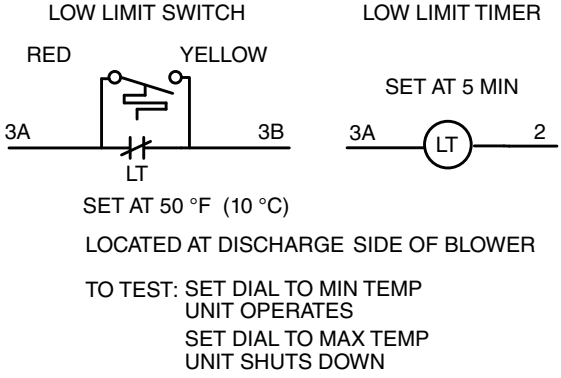
This option is designed to turn the burner off when the incoming outside air is at or above the temperature setpoint. The blower is allowed to run for continued ventilation. The mild weather outside air stat is located in the control enclosure. It has an adjustable setting between -20° F (-29° C) and 100° F (38° C).



Part Number	Description	Models
80930	Mild Weather Outside Air Stat	B-350 - B-5000

17.8.2 Low Temperature Limit with Override Timer

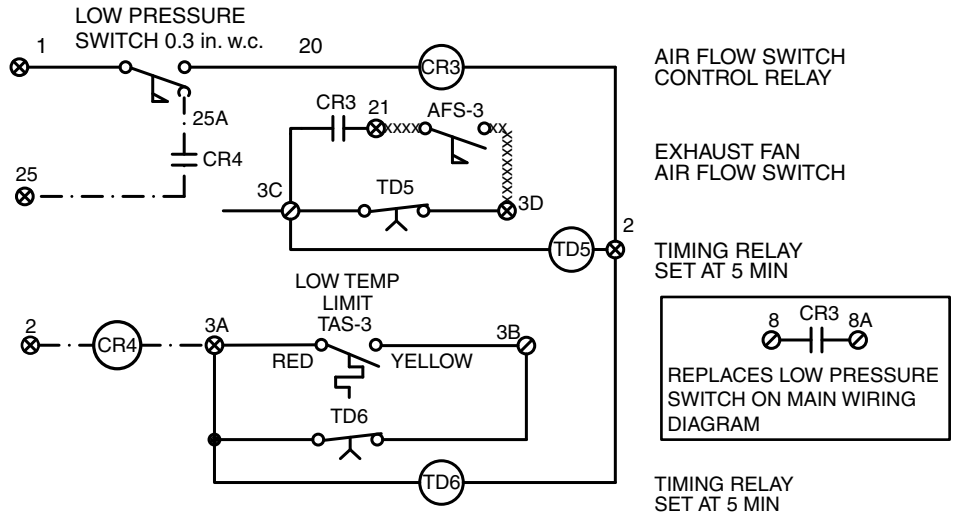
This option is designed to turn the unit off when air is discharged below the temperature setpoint for a period in excess of timer setpoint. The low temperature limit switch is located in the air handler's control enclosure. The low temperature limit switch has an adjustable setting between -20° F (-29° C) and 100° F (38° C). The timer by-passes the low temperature limit switch for the first 5 minutes to allow the burner to establish a flame when the air handler is turned on. If the air handler's discharge temperature falls to the predetermined low temperature limit setpoint, after the 5 minute establishing period, the air handler's blower will be turned off. To reset the low temperature limit switch, set the fan switch to off and then on again. The air handler will return to the normal sequence of operations.



Part Number	Description	Models
01003	Low Temperature Limit with Override Timer	B-350 - B-5000

17.8.3 MUA / Exhaust Failsafe Interlock

This option incorporates the low temperature limit with override timer and an exhaust fan airflow switch monitor. The exhaust fan airflow switch is field provided and field wired as per the option sheet supplied with the unit. When the air handler is turned on there is a 5 minute establishing period for the low temperature limit switch and the exhaust fan interlock. If the air handler's discharge temperature falls to the predetermined low temperature limit setpoint, after the 5 minute establishing period, the air handler fan will be turned off. If there is a failure of the exhaust fan to activate the field supplied airflow switch, after the 5 minute establishing period, the air handler fan will be turned off. To reset the MUA/ exhaust failsafe interlock, set the fan switch to off and then on again. The air handler will return to the normal sequence of operations.



-AFS-3: FIELD LOCATE ON EXHAUST FAN, SWITCH PROVIDIED BY OTHERS
-LOW TEMP LIMIT LOCATED AT DISCHARGE SIDE OF BLOWER
-TO TEST: SET DIAL TO MIN TEMP UNIT OPERATES
SET DIAL TO MAX TEMP UNIT SHUTS DOWN

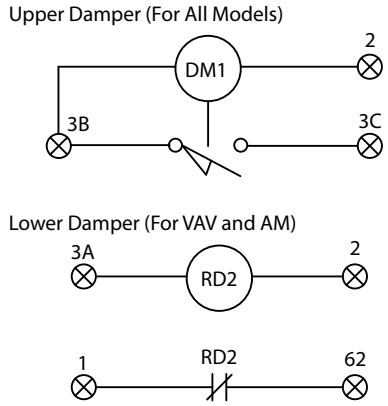
NOTE: -LOW PRES. SWITCH (BETWEEN WIRES 1 AND 20) REPLACES LOW PRES. SWITCH (BETWEEN WIRES 8 AND 8A)
-CR3 RELAY NORMALLY OPEN CONTACTS REPLACE LOW PRESSURE SWITCH ON MAIN WIRING DIAGRAM (BETWEEN WIRES 8 AND 8A)

xxxxxxxxxx FIELD WIRED BY OTHERS
— · — · — CLOGGED FILTER WIRING FOR SDC (80010) AND DTC (80000) REMOTE PANELS

Part Number	Description	Models
01004	MUA/Exhaust Failsafe Inlock	B-350 - B-5000

17.8.4 Motorized Inlet Damper

The motorized inlet damper covers the outside air inlet of the air handler. When the air handler blower is turned on, the damper motor is energized and opens the damper. The damper motor has an auxiliary switch that prevents the blower from starting until that damper has opened sufficiently to allow the required air volume to pass through the air handler.

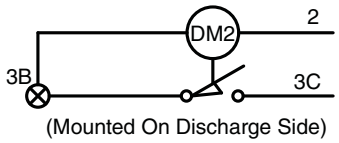


-FR uses upper only
-MUA uses upper with a mechanically connected lower

Part Number	Description	Models
77019.301	Inlet Damper	B-350
80900	Inlet Damper	B-650 and B-1000
80920	MUA Inlet Damper	B-2000
80920U	FR/AM/VAV Inlet Damper	B-2000
77530	MUA Inlet Damper	B-3000
77830U	FR/AM/VAV Inlet Damper	B-3000
80204.1	MUA/VAV Inlet Damper	B-4000 and B-5000
80204.2	FR/AM Inlet Damper	B-4000 and B-5000

17.8.5 Motorized Discharge Damper

The motorized discharge damper is mounted in the duct downstream from the discharge opening of the air handler. When the air handler fan is turned on the damper motor is energized and opens the damper. The damper motor has an auxiliary switch that prevents the blower from starting until that damper has opened sufficiently to allow the required air volume to pass through the air handler.

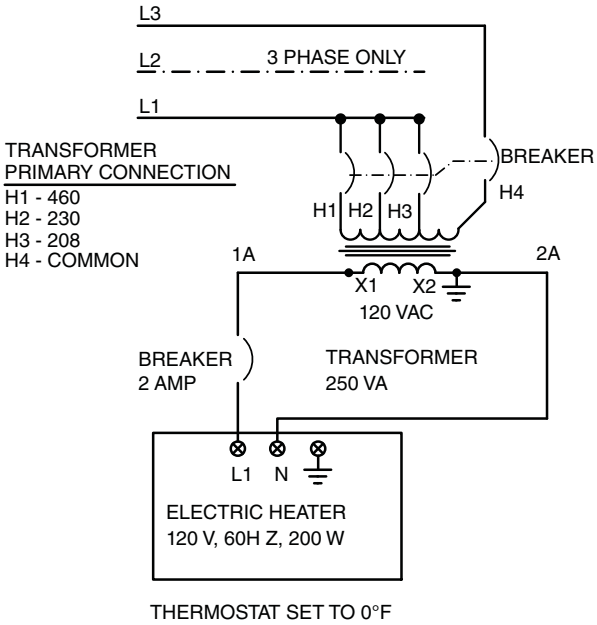


(Mounted On Discharge Side)

Part Number	Description	Models
77014.301	Discharge Damper	B-350
77018.301	Discharge Damper	B-650 and B-1000
80922.2	Discharge Damper	B-2000
77837.2	Discharge Damper	B-3000

17.8.6 Control Enclosure Heater

The control enclosure heater is an electric heater that keeps the temperature in the control enclosure within the range for the control components. This option is intended for extremely cold climates. The air handler controls are rated to perform at temperatures as low as -40° F (-40° C). In environments where the air handler may be exposed to lower temperatures, a control enclosure heater may be required.

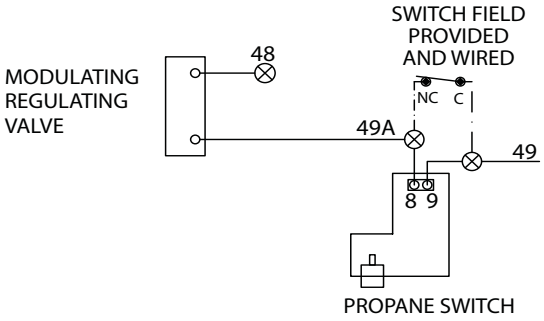


THERMOSTAT SET TO 0°F

Part Number	Description	Models
08110	Control Enclosure Heater	B-350 - B-5000

17.8.7 Propane Switch Kit

The propane switch kit provides the end user with the ability to run the air handler on either natural or propane gas. When the end user wants to switch from natural to propane gas, a switch (field wired and provided by others) will open contacts powering the modulating regulating valve. Power will be sent through the propane switch kit where the signal will be reduced and then sent to the modulating regulating valve. This will cause the modulating regulating valve to open less for the propane, allowing for the same temperature rise.



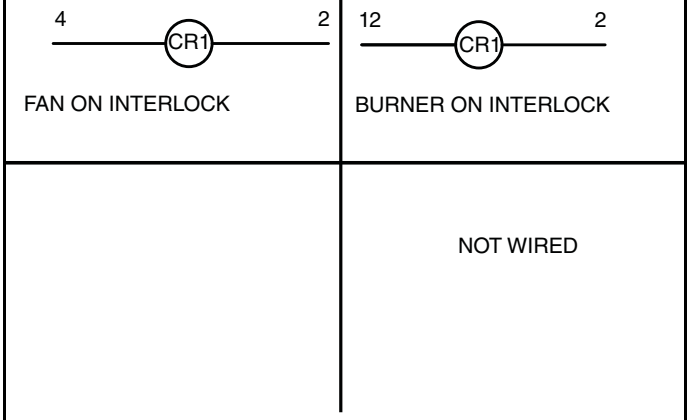
THIS REPLACES THE MRV WIRING
LOCATED ON THE MAIN DIAGRAM

ADJUSTMENTS:
1) MAKE NORMAL HIGH AND LOW FIRE ADJUSTMENTS WITH SWITCH CLOSED AS OUTLINED IN THE MANUAL
2) OPEN SWITCH, REMOVE THE BRASS CAP FROM RHEOSTAT AND ADJUST TO REDUCE HIGH FIRE SETTING, REPLACE CAP.

Part Number	Description	Models
17854	Propane Switch Kit	B-350 - B-5000

17.8.8 Auxiliary Relay

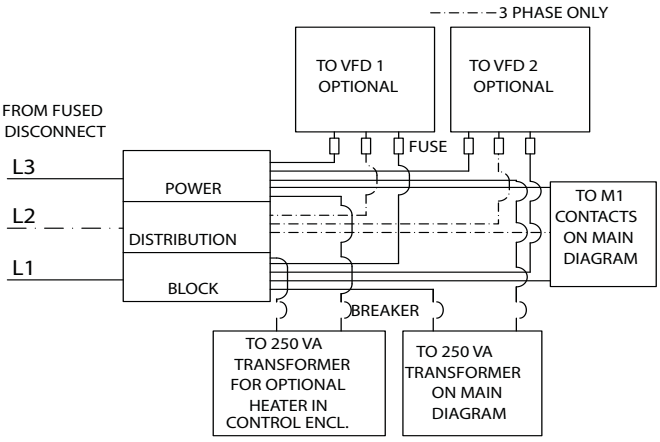
An auxiliary relay may be added to an air handler for either an interlock or a customer defined purpose. Refer to the option sheet supplied with the air handler to indicate whether the relay is wired for an intended purpose or left unwired for a future interface. Each relay will be double pole double throw (DPDT) type. Maximum switching capacity on the normally open contact is 8A, and for the booth light relay, P/N 80916.2, 15A.



Part Number	Description	Models
80916	Aux Relay, Fan On	B-350 - B-5000
80916.1	Aux Relay, Burner On	B-350 - B-5000
80916.3	Aux Relay, Not Wired	B-350 - B-5000

17.8.9 Single Point Connection

When a variable frequency drive or auxiliary motor starter (both used for controlling an exhaust fan) or an enclosure heater are ordered, the installer/service technician must bring in separate power wires and fused disconnect (provided by others) to power these options. The single point connection allows the installer/service technician to bring only one set of power wires into the air handler. Additional fusing is also provided to protect the variable frequency drive and/or enclosure heater.



Part Number	Description	Models
Various	DF Single Point Connection	B-350 - B-5000

17.9 Disconnect Fuse Sizing

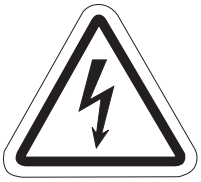
The fuse classification must be determined by the service disconnect rating plate and all applicable codes. Fuse sizing is determined by the motor size, control current and supply voltage. Fuses that are being replaced must be replaced with the same type, size and class of fuse that was supplied with the air handler. For additional information or to confirm original fuse specifications, consult the factory.

Table 16: Minimum and Maximum Fuse Size by Motor Size and Supply Voltage

	Electrical Characteristics				
Motor Size (HP)	**208/3/60**	**230/3/60**	**460/3/60**	**575/3/60**	**230/1/60**
2	7.3-10.2	6.9-9.6	3.4-4.8	2.6-3.6	13.3-18.6
3	10.1-14.2	9.3-13.0	4.6-6.5	3.7-5.2	17.3-24.2
5	15.4-21.6	15.1-21.1	7.5-10.6	6.1-8.5	24.3-34.0
7.5	23.1-32.4	21.3-29.8	10.6-14.9	8.3-11.6	32.3-45.2
10	30.4-42.6	28.1-39.3	14.0-19.7	10.6-14.8	40.3-56.4
15	42.4-59.4	39.3-55.0	19.6-27.5	16.8-23.5	-
20	51.4-72.0	49.3-69.0	24.6-34.5	19.8-27.7	-
25	66.4-93.0	61.3-85.8	30.6-51.3	30.2-42.3	-
30	78.4-109.8	73.3-102.6	36.6-51.3	30.2-42.3	-
40	105.4-147.6	96.3-134.8	48.14-67.4	39.4-55.2	-
50	131.4-184.0	122.3-171.2	61.14-85.6	49.8-69.7	-

SECTION 18: SEQUENCE OF OPERATION

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

⚠WARNING

Carbon Monoxide Hazard

Do not recirculate air from the heated space over burner.

Air supply to burner must be from outside.

Failure to follow these instructions can result in death or injury.

18.1 Air Handler Configuration

Based on the air handler application, the air handler may be configured in any of the four styles described in the upcoming sections. These configurations are available on all air handlers, except the B-350 which is only available in the MUA style. For a comparison of these configurations, *see Page 108, Table 17 and Page 108, Figure 64*.

For AM and FR style air handlers, a carbon dioxide sensor must be installed limiting the building carbon dioxide concentration to 5000 ppm. This sensor is field supplied (*See Page 101, Figure 61 through Page 102, Figure 63*).

18.1.1 Make-Up Air (MUA) Style

The MUA style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. This style air handler supplies 100% outside air to the heated space and is not capable of supplying return air.

18.1.2 Fixed Recirculation (FR) Style

The FR style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. In all cases, however, the air being delivered directly over the burner for combustion must always be 100% outside air. The air handler delivers 20% outside air and 80% of return air. The outside air is heated then mixed with the return air prior to being delivered to the heated space.

18.1.3 Air Management (AM) Style

The AM style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. A building pressure sensor is used to detect the differential pressure between the outside and the heated space. The total volume of air delivered by the air handler may at times consist of 0% to 80% return air. An automatic control is provided for the outdoor air and return air dampers. A diaphragm pressure switch is used to sense a positive space pressure (room or duct). This diaphragm switch is mounted in the control enclosure. More or less outdoor air is brought into the space to satisfy the pressure setpoint. Most installations require a setpoint of 0.02 in wc to 0.03 in wc to achieve adequate pressure control in the building space. 5/16" diameter tubing connected to the positive pressure port of the switch must run to the inside of the building. 5/16" diameter tubing connected to the negative pressure port of the switch must run to the outside of the building.

18.1.4 Variable Air Volume (VAV) Style

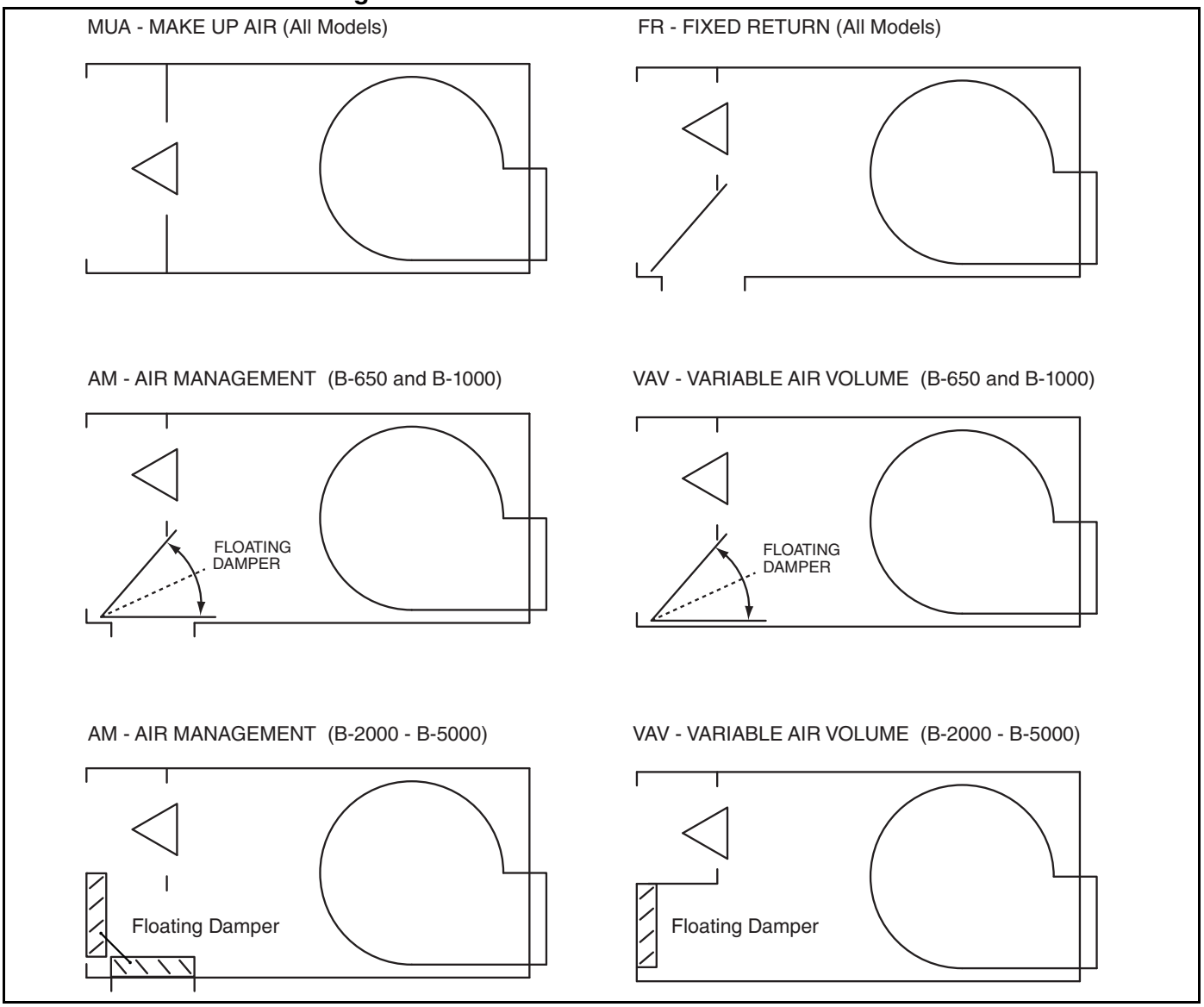
The VAV style air handler uses a building pressure sensor to detect differential pressure between the outside and the heated space. The air handler will deliver 100% outside air and will not deliver return air. The air handler will ensure proper air velocity over the burner by using a photohelic air sensor to measure the pressure drop across the burner and by using a damper to modify the airflow when a pressure change is required. A second photohelic air pressure sensor is used to measure the differential pressure between the outside and the heated space. Most installations require a setpoint of 0.02 in wc to 0.03 in wc to achieve adequate pressure control in the building. The second pressure sensor is used to provide a control signal to the variable frequency drive that, in turn, controls the blower speed. 5/16" diameter tubing connected to the positive pressure

port of the pressure sensor must run to the inside of the building. 5/16" diameter tubing connected to the negative pressure port of the pressure sensor must run to the outside of the building.

Table 17: Configuration Chart

Air Handler Configuration	Air Flow	Air Volume	Control
MUA	100% Outside Air	Constant	-
FR	Non-adjustable ratio of 20% outside air and 80% return air	Constant	-
AM	Adjustable ratio of 20% outside air and 80% return air to 100% outside air and 0% return air	Constant	Building Pressure Controls Outside/ Return Air Ratio
VAV	100% Outside Air	Variable 50% - 100%	Building Pressure Controls Air Volume Requirement

FIGURE 64: Air Handler Configurations


MUA - MAKE UP AIR (All Models)
FR - FIXED RETURN (All Models)
AM - AIR MANAGEMENT (B-650 and B-1000)
FLOATING DAMPER
VAV - VARIABLE AIR VOLUME (B-650 and B-1000)
FLOATING DAMPER
AM - AIR MANAGEMENT (B-2000 - B-5000)
Floating Damper
VAV - VARIABLE AIR VOLUME (B-2000 - B-5000)
Floating Damper

18.2 HVAC Remote Panels and Panel Options

The remote panel should be mounted in the heated space in a convenient location for controlling the air handler. Do not locate a remote panel that contains temperature sensing equipment in an area directly affected by the air handler or another heat source as it may interfere with the operation of the air handler.

18.2.1 Basic II HVAC Remote

This control is typically used for air handlers providing make-up air. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial.

FAN ON/BURNER ON Mode:

The air handler (blower and burner) operates continuously, discharging air at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial.

FAN ON/BURNER OFF Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperature on the temperature selection dial.

FAN ON indicator:

Indicates that the unit is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the unit has supplied power to open the main gas safety shut off valve.

18.2.2 Standard Discharge Control (SDC) Remote

MAXITROL
Selectra
WHITE-RODGERS
OPERATING INSTRUCTIONS
TO OPERATE AS HEATER:
1. TURN MAIN AND PILOT GAS VALVE ON.
2. TURN POWER DISCONNECT SWITCH ON.
3. SET FAN SWITCH TO "FAN ON" OR "FAN AUTO".
4. SET BURNER SWITCH TO "WINTER (BURNER ON)".
5. SELECT ROOM TEMPERATURE.
TO OPERATE AS VENTILATOR:
1. TURN POWER DISCONNECT SWITCH ON.
2. SET FAN SWITCH TO "FAN ON".
3. SET BURNER SWITCH TO "SUMMER (BURNER OFF)".
TO SHUT OFF:
1. SET FAN SWITCH TO "OFF" AND BURNER SWITCH TO "SUMMER (BURNER OFF)".
FAN ON
BURNER ON
BURNER LOCKOUT
CLOGGED FILTER
SUMMER (BURNER OFF)
FAN ON
OFF
WINTER (BURNER ON)
FAN AUTO
BANANZA

This control is typically used for air handlers providing space heating. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. While in "auto" mode, a space temperature thermostat controls the operation of the air handler to maintain the desired space temperature.

AUTO/WINTER Mode:

The air handler (blower and burner) cycle on and off to maintain space temperature as selected on the room thermostat. When the air handler is operating, air is being discharged at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. The discharge air temperature setting must be higher than the thermostat setting.

ON/WINTER Mode:

The air handler (blower and burner) operate continuously to provide heated air. When the air handler is operating, air is being discharged at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. The unit disregards the thermostat setpoint while in this mode.

ON/SUMMER Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperatures on the temperature selection dial and thermostat.

FAN ON indicator:

Indicates that the air handler is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the air handler has supplied power to open the main gas safety shut off valve.

BURNER LOCKOUT indicator:

The burner control module has experienced a fault and will need to be reset. The burner control module must be reset at the air handler. Refer to *Page 124, Section 20* and *Page 137, Section 22* to determine the cause of the fault.

CHECK FILTER indicator:

The airflow in the unit is insufficient to activate the low pressure switch. This is most commonly caused by dirty filters, but could also indicate other obstructions in the air stream.

18.2.3 Deluxe Temperature Control (DTC) Remote

This control is typically used for providing automatic day/night space heating. The burner flame modulates and varies the discharge air temperature to maintain the space temperature set on the Selectrastat dial. The 7-day programmable touchscreen thermostat provides nighttime setback for unoccupied space heating.

AUTO/WINTER Mode:

Occupied time: Blower and burner cycle operate continuously to maintain a constant space temperature as selected on the Selectrastat dial. The burner flame fully modulates and varies the discharge air temperature to maintain the space temperature.

Unoccupied time: Blower and burner cycle on and off to maintain space temperature as selected on the touchscreen thermostat (night setback).

ON/WINTER Mode:

Blower and burner operate continuously to maintain a constant space temperature as selected on the Selectrastat dial. The burner flame modulates and varies the discharge air temperature to maintain the space temperature.

ON/SUMMER Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperatures on the temperature selection dial and thermostat.

FAN ON indicator:

Indicates that the air handler is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the air handler has supplied power to open the main gas safety shut off valve.

BURNER LOCKOUT indicator:

The burner control module has experienced a fault and will need to be reset. The burner control module must be reset at the air handler. Refer to *Page 124, Section 20* and *Page 137, Section 22* to determine the cause of the fault.

CHECK FILTER indicator:

The airflow in the air handler is insufficient to activate the low pressure switch. This is most commonly caused by dirty filters but could also indicate other obstructions in the air stream.

18.2.4 BMS-Ready Control Option

The BMS-ready option provides inputs to receive control signals from a customer determined control system. Each BMS input is capable of receiving a 4-20mA or 0 - 10VDC from the control system. On all air handlers, the burner modulation will be controlled by the control system. For AM style air handlers, the control system can also control the modulating damper.

18.3 Basic Air Handler Sequence of Operation

While the control transformer is energized, the secondary side supplies 115 VAC to the control circuit. When the fan switch is in the "on" position, the M1 motor starter is energized and starts the blower motor. The M1 motor starter auxiliary contact supplies voltage to the burner switch and "Fan On" light. When the burner switch is in the "on"/"winter" position, power is supplied to the flame control module and the burner control circuit. The burner control circuit includes the high temperature limit switch and the low and high airflow pressure switches. Once the burner control circuit is satisfied, then the flame control module will execute the burner ignition sequence. Once the pilot flame is ignited and sensed by the UV scanner, the flame control module will open the safety shutoff valve to ignite the main flame. When the safety shutoff is opened, 115 VAC is applied to the "Burner On" light and T3 transformer, the secondary side supplies 24 VAC to the temperature control amplifier. The temperature control amplifier controls the modulating valve based on the discharge temperature monitor (and also the room temperature monitor in the case of a DTC remote panel).

On DDC/BMS-ready systems, no temperature control amplifier is installed. Discharge temperature monitoring and modulation valve adjustment are done by the customer supplied control system.

18.3.1 Flame Control

The flame control is a safety device and not servicable. See *Page 112, Figure 65 through Page 114, Figure 67* for detailed sequence of operation.

The RM 7890 and RM 7897 must be configured prior to replacement. This is done by removing certain configuration jumpers on the upper left corner of the flame control, located behind the blue cover. *See Page 115, Figure 68*.

FIGURE 65: S8600 Flame Control

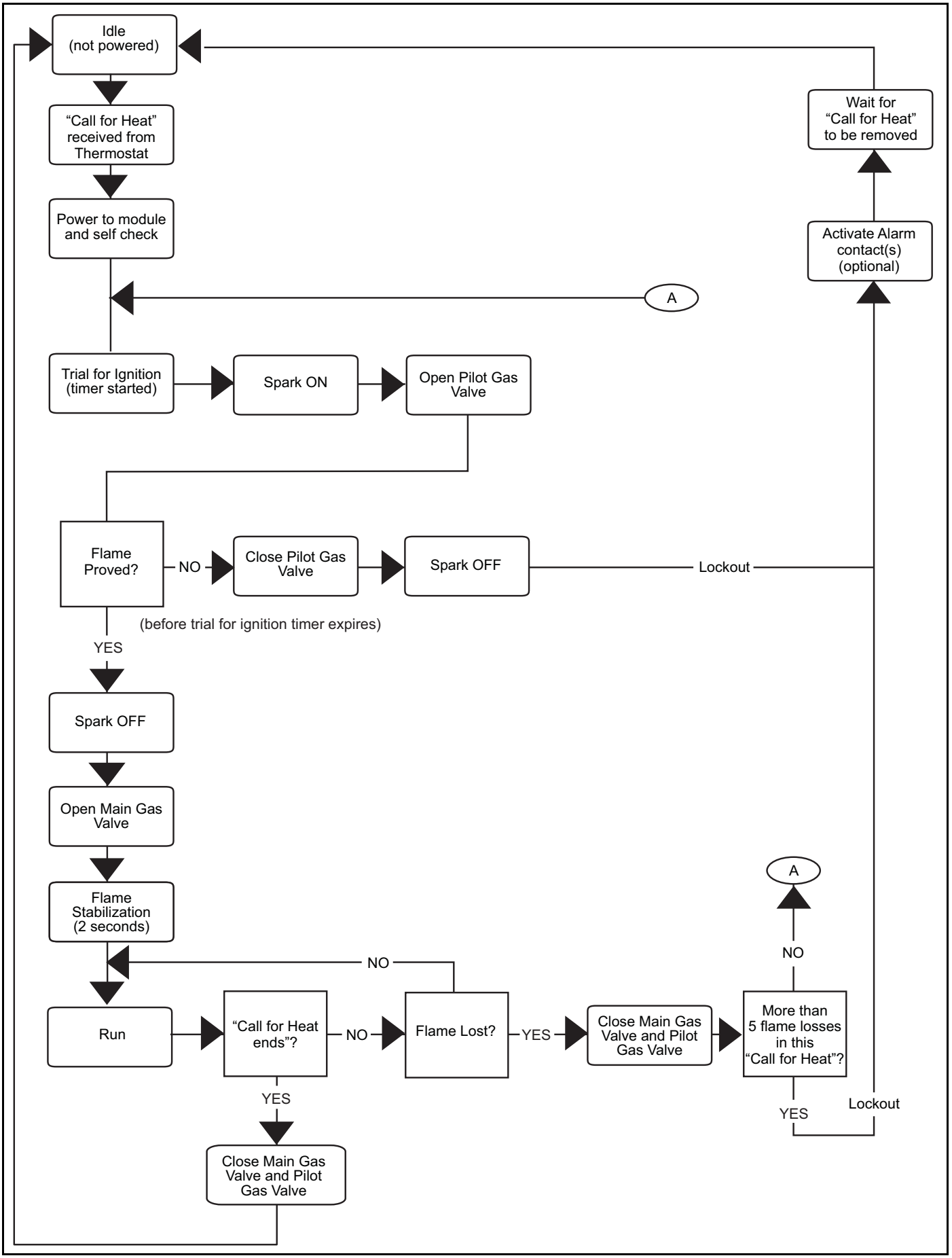
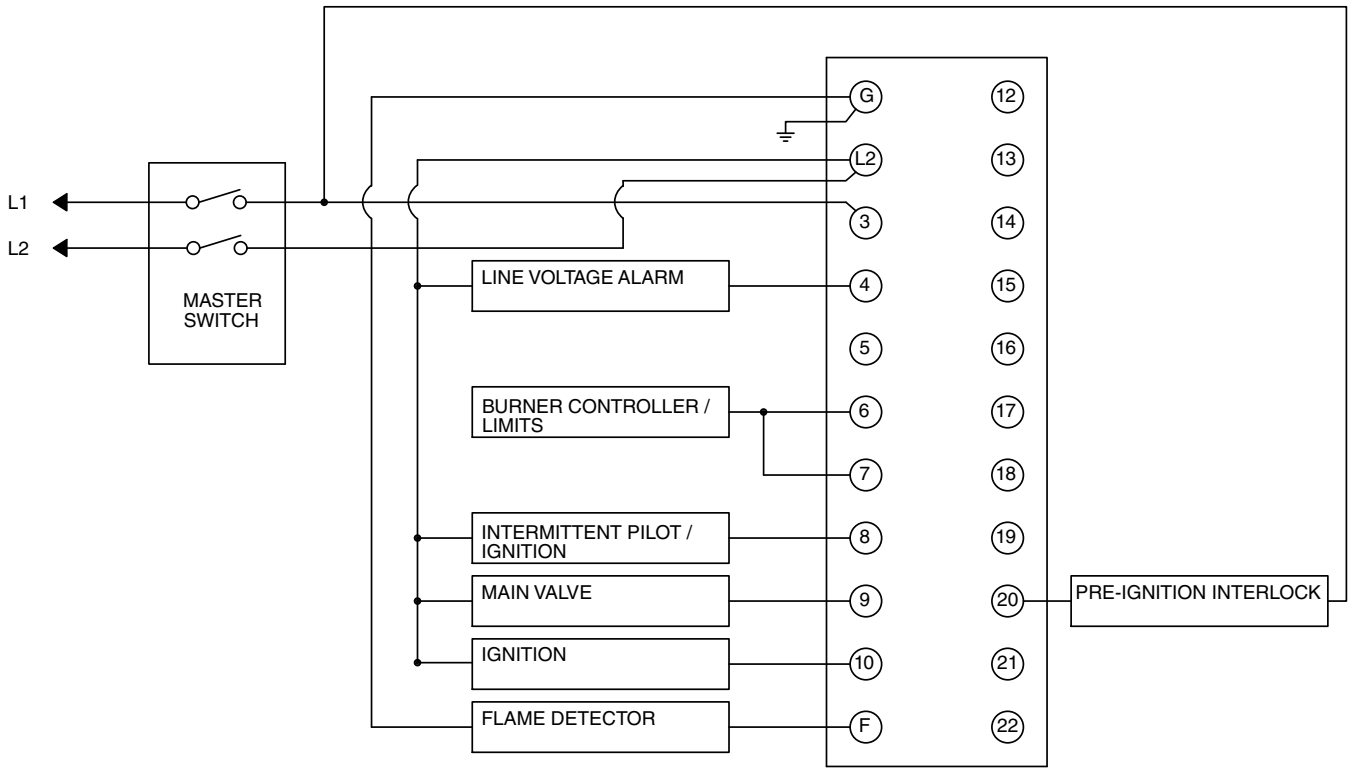
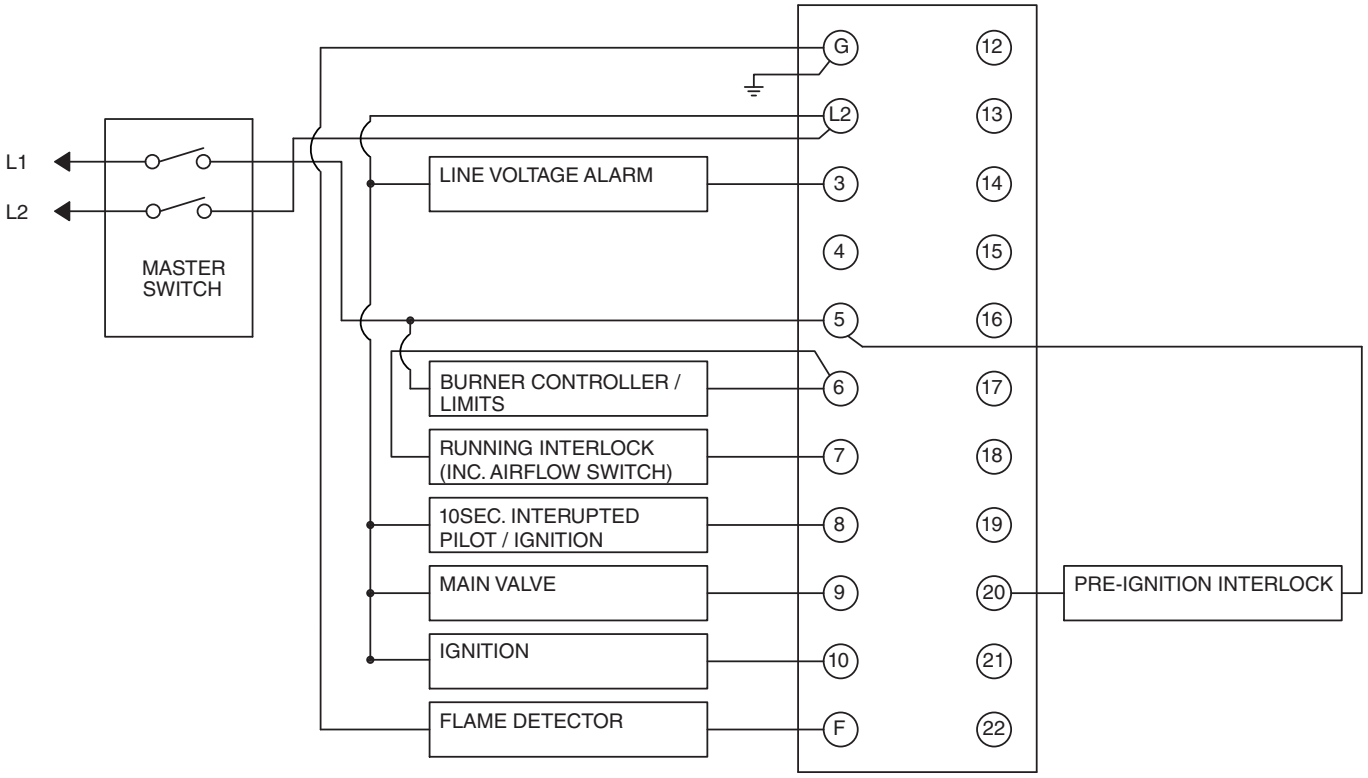


FIGURE 66: RM7890 Flame Control



	Initiate (Initial Powerup Only)	Standby	Safe-Start	Pilot Flame Establishing Period (10 Sec)	Main Flame Establishing Period	Run	Standby
LED Display	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ● Pilot ● Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ❍ ❍ ❍ ❍
Burner Start				Ignition ⑩			
				Intermittent Pilot ⑧⑩			
					Main Valve ⑨		
Operating Controller and Limits			Limits and Burner Control Closed ⑥⑦				
Flame Signal		Safe Start Check			Flame Proving		SSC
	Preignition Interlock (PII)						PII

FIGURE 67: RM7897 Flame Control



	Initiate (Initial Powerup only)	Standby	Prepurge (7 Sec)	Pilot Flame Establishing Period (10 Sec)	Main Flame Establishing Period	Run	Postpurge	Standby
LED Display	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ❍ Pilot ❍ Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ❍ Pilot ● Flame ● Main ❍ Alarm	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍
Burner			Burner/Blower Motor ⑤					
				⑩ Ignition				
				Interrupt/Pilot ⑧				
					Main Valve »⑨			
Operating Controls and Interlocks			Limits and Burner Controller Closed Ⓛ to ⑨					
				Running Interlock ⑥ to ⑦				
		Preignition Interlock Closed		⑤ to ⑳				PII
Flame Signal		Safe Start Check			Flame Proving			SSC

FIGURE 68: Selectable Configuration Jumpers

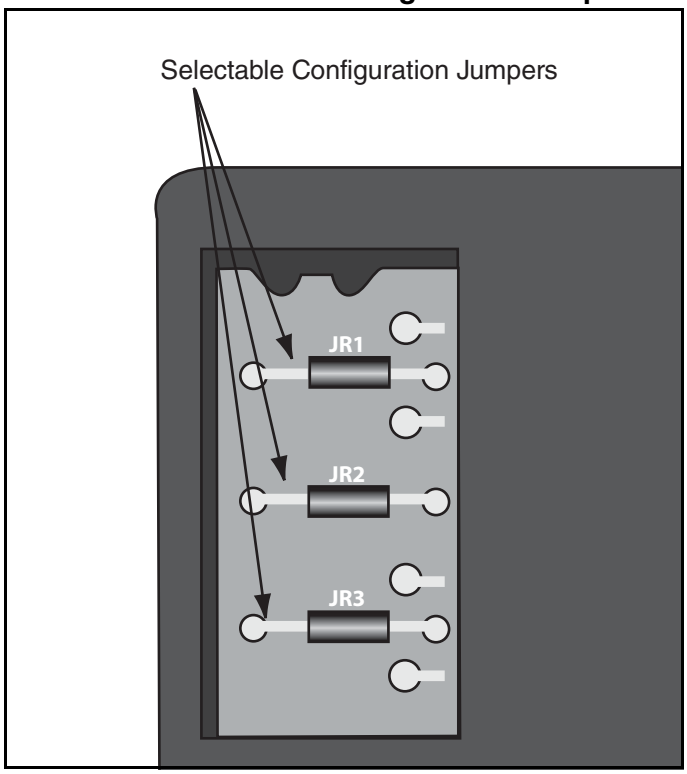
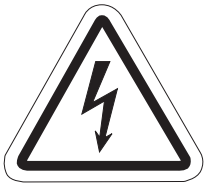


Table 18: Site-Configuration Jumper Options

Jumper Number	7890	7897
JR1	Intact	Intact
JR2	Remove	Remove
JR3	Intact	Intact

SECTION 19: START-UP PROCEDURES

⚠ DANGER

	
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from equipment.** **Equipment must be properly grounded.**	**Severe Injury Hazard** **Do not enter equipment while in operation.** **Equipment may start automatically.** **Do not operate with door open.** **Installation, operation and service must be done by a trained technician only.**
Failure to follow these instructions can result in death, electrical shock or injury.	

⚠ WARNING

Explosion Hazard **Leak test all components of equipment gas piping before operation.** **Gas can leak if piping is not installed properly.** **Do not high pressure test gas piping with equipment connected.**	**Carbon Monoxide Hazard** **Do not recirculate air from the heated space over burner.** **Air supply to burner must be from outside.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Burn Hazard** **Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**
Failure to follow these instructions can result in death, injury or property damage.			

Installation Code and Annual Inspections:
All installation and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment. To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor conduct, at a minimum, annual inspections of your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

Check installation site to ensure all codes and engineering specifications are correct. This section of the manual is intended to be used as an instructional guide to the commissioning of the direct fired air handler. Fill out the start up sheet on *Page 147* as each step of the procedure is performed.

This procedure must be completed by the commissioning contractor and returned to Bananza.

19.1 Installation of Recirculating Air Handler

Every direct-fired air handler which recirculates room air (i.e., AM and FR styles) must utilize either a control system which limits temperature rise in proportion to the amount of outdoor air, or a room carbon dioxide sensor, installed per the manufacturer's recommendations. The normally-closed contacts of this sensor must be wired in as per the CO_2 interlock diagram, maintaining the room concentration of CO_2 below 5,000 ppm. Select the CO2 interlock diagram based on air handler configuration and model. *See Page 101*, *Figure 61 through Page 102, Figure 63*.

19.2 Mechanical

This appliance requires at least 4 CFM (6.8m^3/h) of outside air per 1,000 Btu/h (0.293 kW).

Before installation, check that the local distribution condition, nature of gas and pressure, and the current state of adjustment of the appliance are compatible.

If filters are not installed (via inlet hood or filter section), an air strainer must be installed on the inlet of the air handler with openings less than or equal to 5/8" (16 mm) in diameter.

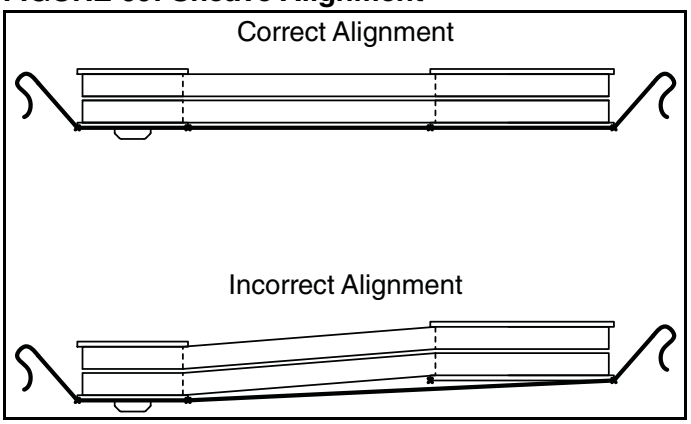
Air inlets must be installed with the lowest edge 19" (500 mm) above any surface. This applies to roof curbs, upright stands and suspended air handlers.

19.2.1 Sheave Alignment

Sheaves are factory aligned. On all air handlers, check sheave alignment as follows.

1. Tie a string to the vertical channel next to the blower shaft bearing. (as shown)
2. Wrap the string around the blower sheave and across both sheave surfaces as shown.
3. Adjust until all four contact points (triangle) touch the sheave surfaces. "IN" or "OUT" adjustment of the motor sheave and/or motor adjustment may be required.
4. Pull the string away from the motor sheave and then move it slowly back towards the sheave, making sure the string remains straight while touching all contact points.
5. Remove string before turning air handler on.

FIGURE 69: Sheave Alignment



19.2.2 Belt Tension

- Belt tension should be checked with a belt-tension gauge when one is available. Follow the belt tension gauge instructions.
- When a tension gauge is not available, measure the belt span of the belts.
- Allow for 1/64" (0.39 cm) of deflection for each inch of center distance length for the charted pounds of force. Check the table below for proper deflection force.
    - EXAMPLE: A 40" (101.6 cm) shaft center distance would dictate 40"/64" or 5/8" (1.59 cm) of deflection. With a standard B belt and a motor sheave measuring between 5.8" (14.7 cm) and 8.6" (21.8 cm), the belt will have proper tension if a 5/8" deflection can be achieved with a minimum of 6-3/8 inch lbs. and a maximum of 8-3/4 inch lbs. of pressure as measured with a belt tensioning gauge.

FIGURE 70: Belt Tension

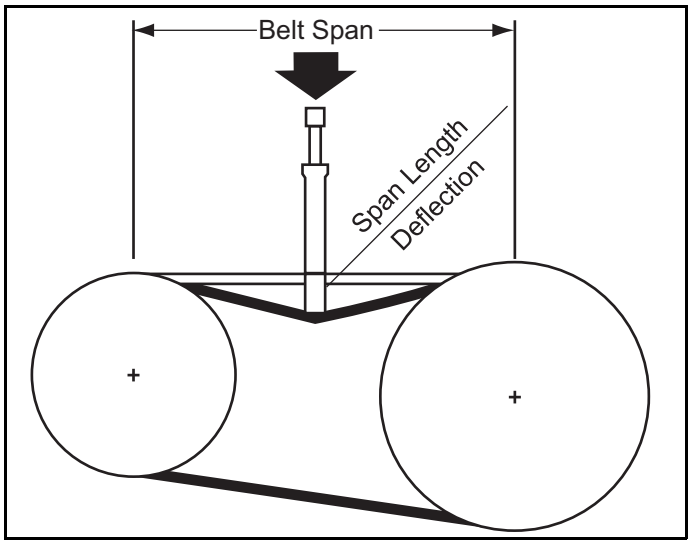


Table 19: Deflection Force B Belts (in lbs)

Belt Cross-Section	Motor Sheave Dimension Range (in) - (cm)	TYPE B		TYPE B-X (High HP)	
		Min.	Max.	Min.	Max.
B	3.4 - 4.2	4	5 1/2	5 3/4	8
	4.4 - 5.6	5 1/8	7 1/8	6 1/2	9 1/8
	5.8 - 8.6	6 3/8	8 3/4	7 3/8	10 1/8

NOTE: If drive belts squeal during start-up, increase belt tension to the highest allowed value. Re-check tension during each inspection.

19.2.3 Air Temperature Sensing

The sensing probe is factory mounted in the blower housing.

19.3 Electrical

1. Check motor starter for proper overload settings. The overload setting should meet full load amps (FLA) of motor.
2. Measure the supply voltage with the air handler off and then on. For a system that is powered with three phase power, measure the voltage of each phase.
3. Verify correct blower rotation.
4. While the blower is running and the burner is off, measure the total system current draw with an ammeter. Measure the system current draw again after the burner adjustments are made and with the burner and blower both on.
5. If applicable, compare all VFD programming parameters with specifications provided on electrical drawing.

19.4 Airflow

The air flow switches are factory calibrated safety devices for burner air flow. If an air flow switch does not close, the problem may not be the air flow switch. It could be an indication of an air flow problem (wrong filters, duct restrictions, etc.).

19.4.1 Differential Pressure

In order to verify proper airflow across the burner, the differential pressure across the profile plate needs to be measured. Attach a manometer to the pressure test ports where the pressure switch is attached and measure the differential pressure with a manometer. This reading must be 0.9 in wc +/- 0.1 in wc. (2.24 +/- 0.25 mbar)

To adjust the differential pressure that was measured in the step above, use the adjustable sheave. To increase the speed of the blower and the differential pressure, turn the adjustable half of the sheave inward (increase diameter). To decrease the speed of the blower and the differential pressure measured at the burner, rotate the adjustable half of the sheave outward (decrease diameter). Both sides of the sheave must be turned equal.

After any adjustment, it is necessary to re-check the alignment, belt tensions and verify that all sheave set screws are tightened to the specified torque value before engaging the blower. *See Page 120, Table 20* and *Table 21*. All sheaves have two set screws to secure the sheave to the motor shaft. On the three

belt sheaves, there are three set screws on the locking collar to hold the size adjustment. On the two belt sheaves, there are four setscrews that hold the size adjustment. On the single belt sheaves, there are two set screws to hold the size adjustment.

Table 20: Motor Sheave Drive Torque Specifications

Setscrew Size	Allen Wrench	Torque Settings	
		in•Lbs	ft•Lbs
1/4"	1/8"	87	7.3
5/16"	5/32"	120	10.0
3/8"	3/16"	290	24.2

Table 21: Motor and Blower Bushing Torque Specifications

Bolt Size (on Bushing)	Torque Settings	
	in•Lbs	ft•Lbs
#10	60	5
1/4"	108	9
5/16"	192	16
3/8"	360	30
1/2"	720	60

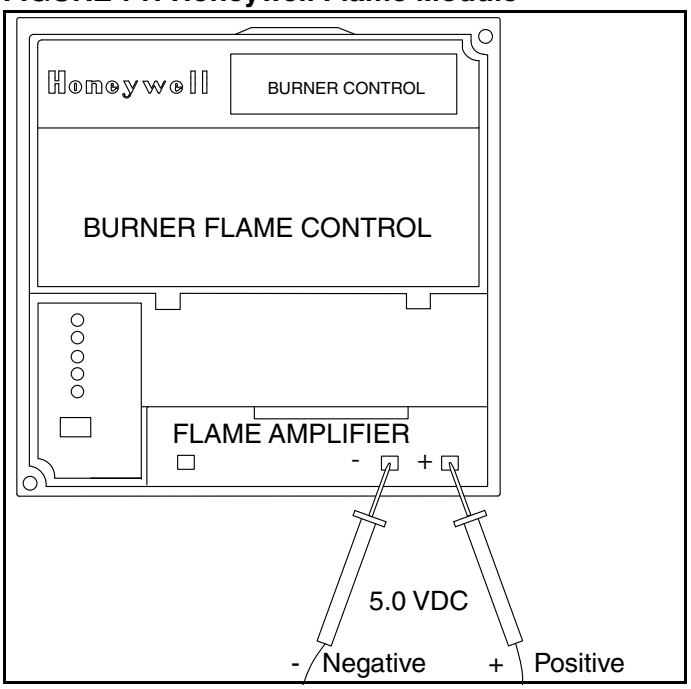
19.4.2 Burner Pressure

1. A pressure tap is used to measure negative airflow at the burner and to set high fire gas pressure. On air handlers equipped with a M611 modulating valve (Model B-350), the pressure tap is located on a tee between the M611 valve and the burner. *See Page 87, Figure 46*. On air handlers equipped with the MR212 modulating valve (Models B-650 - B-5000), the pressure tap could be located on the downstream side of the MR212 valve, on a T-fitting coming off the outlet pressure tap on the MR212 valve or between the MR212 valve and the burner. *See Page 87, Figure 47*.
2. Measure the burner pressure with the inlet manual gas valve off.
   - Open the manual shut off located between the modulating valve and the burner.
   - Turn the blower on and record the negative pressure on a u-tube manometer or gas pressure gauge. This reading is used for high fire burner pressure adjustment.
3. After taking the burner pressure reading, temporarily leave the manometer attached to the 1/8" tap. It will be used later to check high fire gas pressure.

19.5 Gas Piping and Initial Pressure Settings

1. Perform a pressure test on all gas supply lines to the air handler per applicable codes. **Make sure to isolate all gas controls before pressure testing the system.**
2. Verify supply pressure does not exceed maximum rated gas pressure as stated on the rating plate.
3. Set the supply gas pressure at the step down regulator (normally outside of the enclosure if one is installed) according to the name plate rating inlet gas pressure specifications.
4. Only after performing steps 1-3, verify pilot pressure.
   - Place a u-tube manometer or gas pressure gauge on the tee at the downstream side of the pilot pressure regulator.
   - Open the main gas valve and close the gas valve downstream of the MR valve.
   - Set the burner switch to "on" and adjust the pilot pressure regulator to 1.0 in wc for natural gas or 0.5 in wc for LPG.
   - Verify that the burner flame control has a flame signal of 5.0 VDC. *See Page 120, Figure 71*.

FIGURE 71: Honeywell Flame Module



5. Adjust unit high fire gas pressure.
   - Determine the high fire gas pressure by adding the manifold pressure for maximum input (from the rating plate) and the burner negative pressure (from the measurement made in the burner pressure section of this procedure). Record this value for use in adjustment step.

For example:

Negative burner pressure= -1.0 in wc

Maximum manifold pressure (from rating plate)= 2.0 in wc

High fire gas pressure= 2.0 + (-1.0) in wc

High fire gas pressure= 1.0 in wc

- Force the burner into high fire. Refer to the burner mode setting chart *on Page 121, Table 22*, for the specific amplifier and action required to place it into high fire mode.
- Open both manual gas valves at the air handler.
- Set the pressure at the burner side of the modulating valve to the calculated value (from the begining of this step), by removing high fire adjustment cap and rotating the regulator adjustment screw. A clockwise rotation increases manifold pressure. Temperature rise should not exceed maximum as listed *on Page 121, Table 23*. For Model B-350, the high fire gas pressure is set by adjusting the regulator upstream of the M611 valve. *See Page 123, Figure 74*.
- Reconnect any wires that were used for adjustment.

6. Maximum discharge temperature is 160° F (71° C) for models B-350 - B-3000; 150° F (65.6° C) for models B-4000 and B-5000.
7. Low fire adjustment
   - **NOTE:** High fire gas pressure must be set BEFORE adjusting low fire. There are three critical items to consider before adjusting low fire:
     A. Low fire adjustment does not regulate gas pressure.
     B. If the low fire adjustment screw is set to maximum, high fire regulation problems will occur.
     C. The burner control system must be forced into low fire per the "Burner Mode by Amplifier Type" table. *See Page 121, Table 22*.
   - Low fire is set at the MR212 valve using the adjustment screw under the low fire adjustment cap screw (loosen locking screw before adjustment), *See Page 122, Figure 72*, or on the M611 valve using the brass adjusting screw on the front side, *See Page 123, Figure 73*. The burner must be forced into low fire first. Then rotate the adjustment screw until there is a continuous blue ribbon across the entire burner. A counter clockwise rotation increases the flame size. Low fire temperature rise must not exceed 12° F (-11° C). Tighten locking screw when finished.
   - Reconnect any wires that were removed for adjustment.
8. Once gas pressure and high/low fire adjustments are made, the gas setup is completed. All taps and instruments must be removed and all caps and plugs must be replaced.

Table 22: Burner Mode by Amplifier Type

Amplifier Type	High Fire Mode	Low Fire Mode
Series 14	Remove wire #45 from terminal #4 on the amplifier	Remove wire #16 from terminal #8 on the amplifier
Series 44	Remove wire #41 from terminal #5 on the amplifier	Remove wire #16 from terminal #9 on the amplifier

19.6 Safety Shut Off Valve Check

After the initial start up and gas pressure adjustment, verify gas soundness of each SSOV (Safety Shut Off Valve). This check must be repeated after the first 100 hours of operation.

19.7 Temperature Control System Calibration

The temperature control system components are factory calibrated to a base resistance so that component replacement will not upset the system calibration. If the temperature control system should require field calibration, refer to the provided temperature control amplifier product information sheet.

Table 23: Maximum Temperature Rise

Model	Natural Gas		LPG	
	°F	°C	°F	°C
B-350	90	50	70	39
B-650 - B-3000	100	55	80	44
B-4000 - B-5000	100	55	N/A	N/A

FIGURE 72: MR 212 Valve

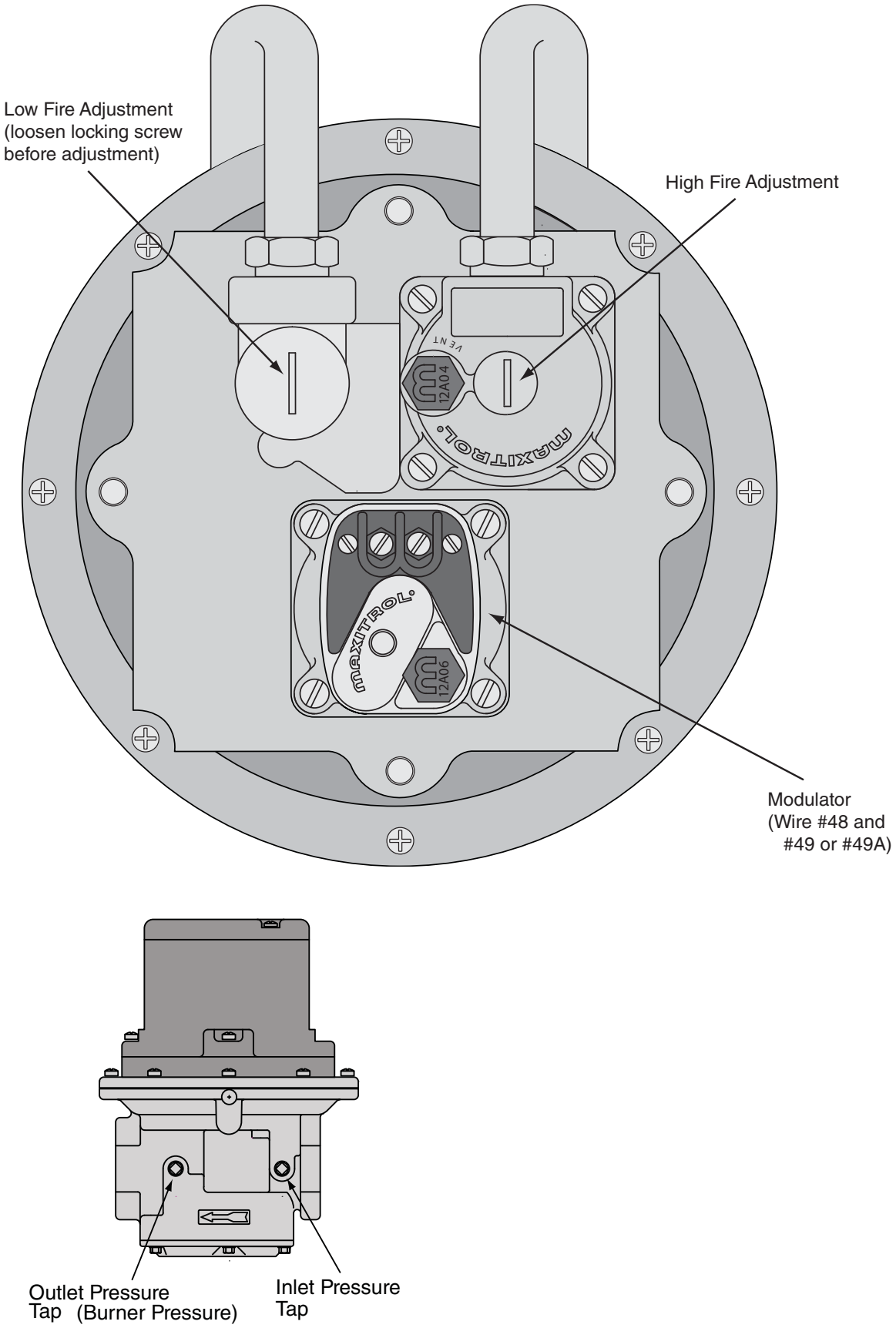


FIGURE 73: M611 Valve

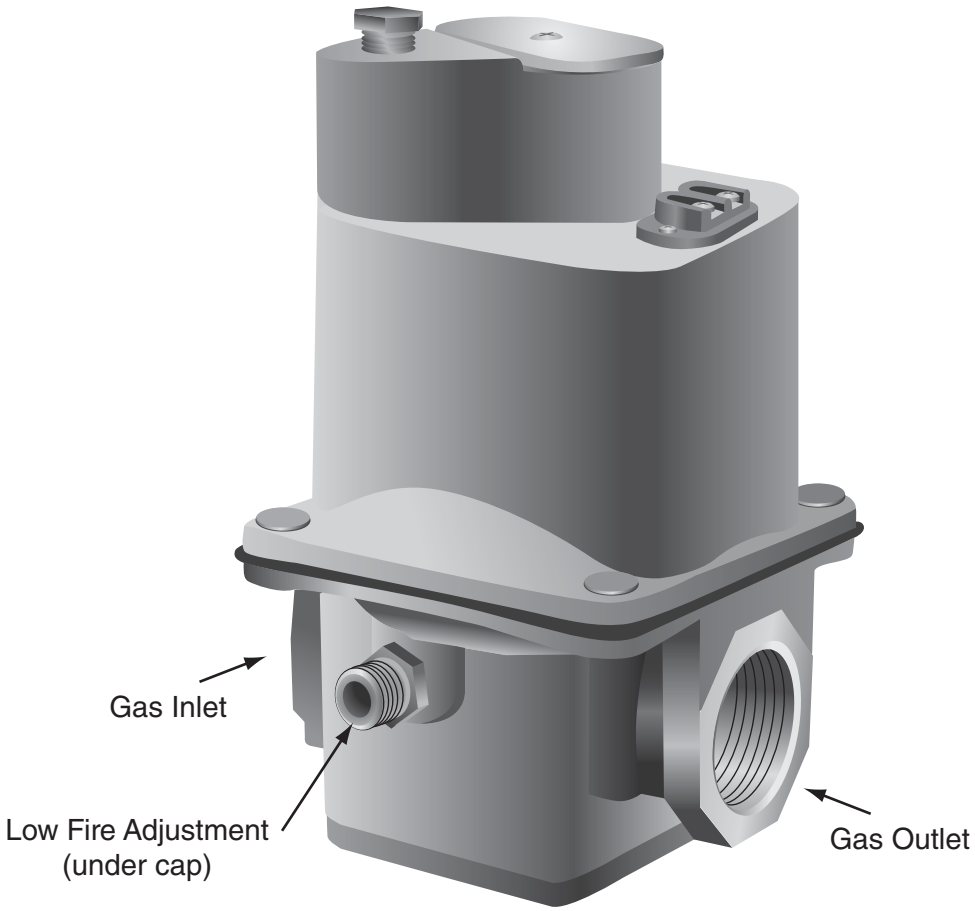
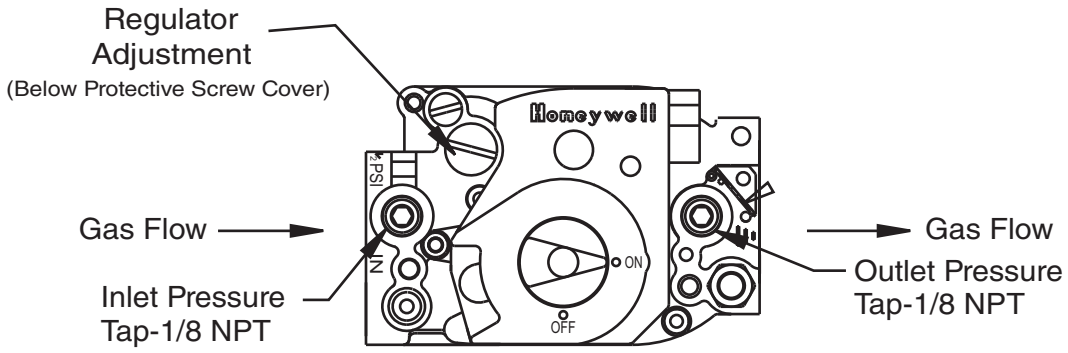
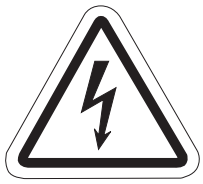


FIGURE 74: B-350 Regulator



SECTION 20: MAINTENANCE

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Severe Injury Hazard

Do not enter equipment while in operation.

Equipment may start automatically.

Do not operate with door open.

Installation, operation and service must be done by a trained technician only.

Failure to follow these instructions can result in death, injury or property damage.

⚠ WARNING

Explosion Hazard

Leak test all components of equipment gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with air handler connected.

Falling Hazard

Use proper safety equipment and practices to avoid falling.

Do not use any part of equipment as support.

Burn Hazard

Allow equipment to cool before service.

Internal components of equipment may still be hot after operation.

Failure to follow these instructions can result in death, injury or property damage.

Prior to any maintenance or service of the air handler, shut off, lockout and tagout the electrical disconnect and gas valve that supplies the unit in accordance with OSHA regulations and allow ample time for the air handler to cool. After maintenance is performed or air handler is serviced, the air handler shall be re-commissioned to the start-up procedure as outlined on *Page 117, Section 19*.

Installation Code and Annual Inspections:
All installation and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment. To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor conduct, at a minimum, annual inspections of your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

20.1 Unit Exterior

Cabinet Exterior	After installation, touch up scratches. Periodic painting should be done thereafter as required. The caulk around weather enclosures and over field joints should be inspected annually. Re-apply caulk as needed to maintain integrity.
Unit Location	Verify that no flammable objects, liquids or vapors are present near the air handler. Do not hang anything from or place anything on the air handler. Keep the area under and around the air handler free of all objects.

20.2 Blower Section

Blower Wheel	Inspect blower wheel and clean as necessary. A small build up of dust can cause a significant decrease in blower performance. Check for excessive vibration, repair as required.
Drive Belts and Sheaves	Check for belt ride in the groove. In multiple groove drives, belt ride should be uniform. Check groove wear area for wear. Side wall of groove should be straight, not dished out. Bottom of groove should not show signs of belt contact. Sheave alignment, set screw torque and belt tension should be checked after 8, 24, and 100 hours of intitial start-up. Visually inspect belts and sheaves for excessive wear. If belts have a slick, glazed look, the belts are slipping. Check drive capacity and belt tension. Never replace only one belt in a used set, as used belts will elongate. Replace the entire set if replacement is necessary.
Blower Bearing Lubrication	Blowers with spider bracket bearings are pre-lubricated and do not require any re-lubrication during their entire service life. Blowers that use pillow block bearings; should be re-lubricated every 3,000 hours of operation or 6 months, whichever occurs first. The recommended lubricant is Shell Alvania #2 or S3 grease. To re-lubricate the blower pillow block bearings, be sure that the grease fittings on the bearing housing (or air handler cabinet wall in the case of extended grease lines) are clean. Apply the recommended grease to the fitting with a low-pressure grease gun and add slowly while the shaft is spun by hand. Do not over-grease. Over-greasing will reduce the service life of the bearings. Consult the blower manufacturer for grease capacity recommendations as capacities vary by model.

Motors

Inspection:

1. Inspect motor every 3 months or 500 hours of operation, which ever occurs first. Keep the motor clean and vent openings clear.

Lubrication:

1. Motors with grease fittings must be lubricated based on the table below.

Table 24: Motor Lubrication Intervals

NEMA Frame Size (Motor HP)	Rated at 1800 RPM
Up to 210 incl. (3 - 5 HP)	6,000 hrs
Over 210 to 280 incl. (7.5 - 20 HP)	4,750 hrs
Over 280 to 360 incl. (25 - 50 HP)	3,700 hrs

NOTE: *These intervals are based on severe duty. Over lubricating bearings could result in reduced motor life.*

2. A high grade ball or roller bearing grease must be used. Recommended grease for standard service is Polyrex EM (Exxon Mobil). Other compatible greases include; Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.
3. Motors without grease fittings are sealed for life and do not require relubrication.

Instructions for Lubricating

Before greasing, be sure fittings are clean and free from dirt. Remove grease relief plug or plate and, using a low-pressure grease gun, pump in the required grease. Do not over-grease. Overgreasing will reduce the service life of the motor. Consult the motor manufacturer for grease capacity recommendations as capacities vary by motor. Relubrication intervals are specified in the table above. After relubricating, allow motor to run for 10 minutes before replacing relief hardware.

NOTE: In general it is not recommended to mix greases of different brands. The mixing of different types of thickeners may destroy the composition and physical properties of the grease. In the event that a different grease is required by the end user, the following steps can be taken. Using the instructions for lubrication, open grease outlet and purge the system as much as possible of the old or unwanted grease. Repeat this same operation after 1 week of service. Consult Bananza or the motor manufacturer for further recommendations on grease compatibility.

20.3 Manifold and Controls

Manifold	Periodically check gas control assembly and internal and external piping for leaks. Relief vent lines to outdoors on gas controls should be checked to ensure against blockage caused by insects or any other substance. Clean as required. All gas piping to the air handler must comply with the National Fuel Gas Code - NFPA54, latest edition and all local codes. Verify gas soundness of each SSOV (Safety Shut Off Valve). This test must be repeated after the first 100 hours of operation.
Air Flow Switch	An annual check of the tubes attached to the air flow switch should be made to ensure against blockage caused by insects or any other substance. Clean as required.
Electric Components	Check for physical damage on any of the electric components and verify all electrical connections are secure. Ensure equipment is properly grounded.
Temperature Sensors	Calibrate space, outdoor air, and discharge air sensors as required.

20.4 Burner

An annual inspection of the burner and components must be made to ensure proper and safe operation. For the most part, the burner is self cleaning. However, if the application is extremely dirty or dusty, it may become necessary to periodically clean the burner. Inspect and clean the burner in accordance with the following recommended procedures:

1. To avoid damaging the valves, disconnect the burner piping from the manifold, at the union in the control enclosure, and cover the exposed end of the manifold.
2. Unscrew the UV scanner from the side of the burner and clean the lens with a soft cloth.
3. Remove the ignition cable from the igniter on the side of the burner, and then remove the spark igniter. Clean the igniter contacts with a wire brush. Set the gap to 0.078" (2.0mm).
4. Inspect each of the stainless steel mixing plates to see that all of the air holes are free of debris. Clean with a wire brush as necessary.
5. The burner orifices may need to be drilled to unplug any closed orifices. *See Page 128, Figure 75 through Figure 77*. Use a pin vise with the appropriate drill, *See Page 128, Table 25*, to clean debris from the orifices. An electric drill is not suggested because it is easy to snap drill bits off in the orifices.
6. Reinstall the UV scanner and the spark igniter. The UV scanner should be installed only finger tight as over tightening can result in damaging the lens. Reconnect the burner piping to the manifold at the union.

FIGURE 75: 12" (30.5 cm) Straight

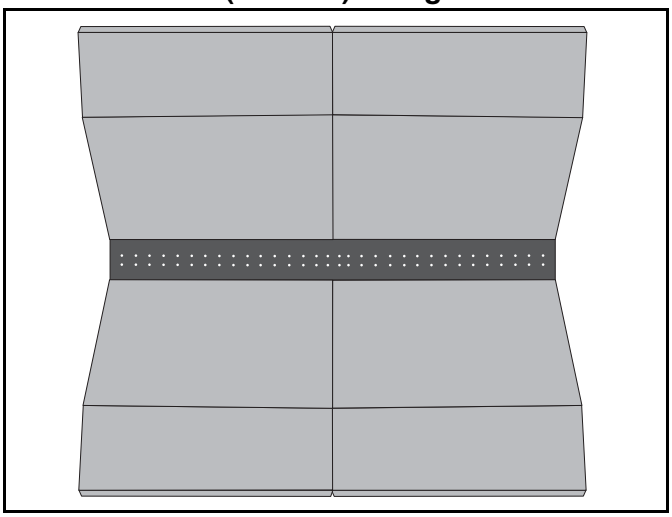


FIGURE 76: (30.5 cm) Tee

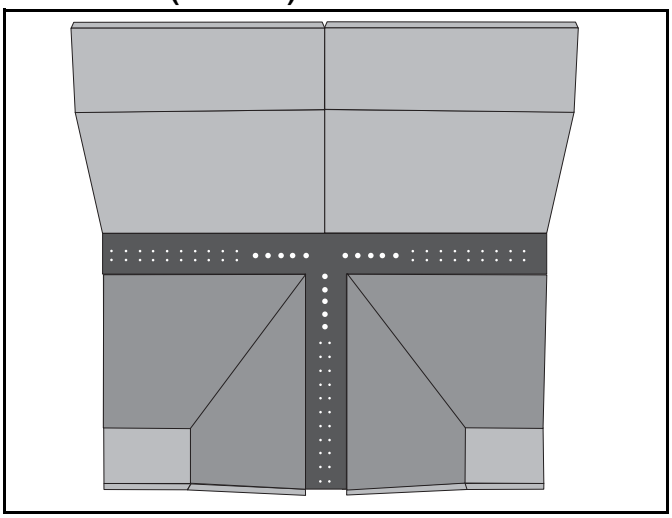


FIGURE 77: 6" x 6" (15.3 cm x 15.3 cm) Elbow

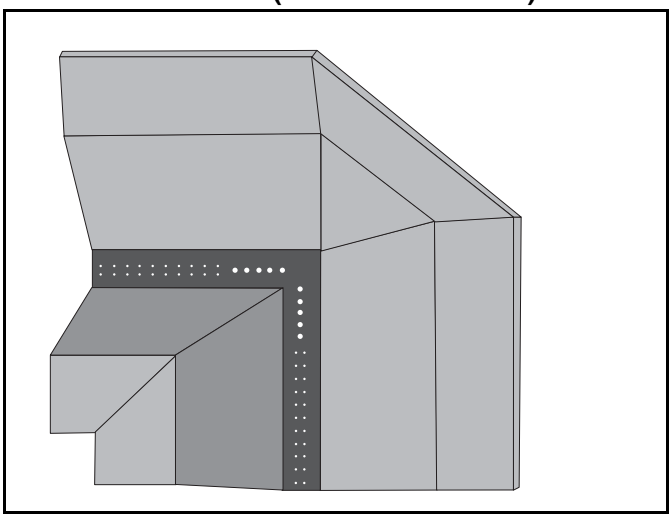


Table 25: Burner Selections

Model		Qty.	Style	Drill Size
B-350		1	6" (15.3 cm) Straight	47
B-650		1	12" (30.5 cm) Straight	47
B-1000		2	12" (30.5 cm) Straight	47
B-2000		3	12" (30.5 cm) Straight	47
		1	6" (15.3 cm) Straight	47
B-3000		3	12" (30.5 cm) Straight	47
		1	12" (30.5 cm) Tee	43,47
B-4000 B-5000	4.5*	5	12" (30.5 cm) Straight	47
		1	6"x6" (15.3 cm x 15.3 cm) Elbow	43,47
	5.6*	7	12" (30.5 cm) Straight	47
		1	6"x6" (15.3 cm x 15.3 cm) Elbow	43,47
	7.0*	9	12" (30.5 cm) Straight	47
		1	6"x6" (15.3 cm x 15.3 cm) Elbow	43,47

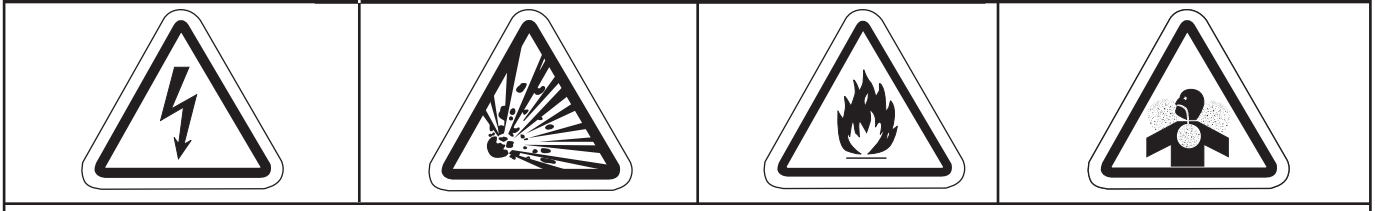
*Btu/h x 1,000,000

20.5 Optional Equipment

Dampers	Check linkage when applicable and tighten set screws as required. All moving parts of dampers should be cleaned and then thoroughly lubricated with a light molybdenum oil in aerosol can. Dampers furnished with stainless steel side seals should also have the seals lubricated generously. Dampers should then be manually operated several times until linkages and blades operate freely. Reconnect linkages and check dampers for proper operation.
Filters	Filters should be checked for dirt restriction on a monthly basis (or as required). Replace filters with filters of equal specification when they appear dirty. **NOTE:** When using Bananza supplied disposable polyester filters, they must be inserted with the white media side facing the inlet of filter section. When using Bananza supplied permanent filters, they must be inserted with the arrow on the filter pointing in the direction of airflow (toward the air handler).
Evaporative DX Cooling	If applicable, refer to separate maintenance literature.

SECTION 21: REPLACEMENT PARTS

⚠ DANGER **⚠ WARNING**



Electrical Shock Hazard **Explosion Hazard** **Fire Hazard** **Carbon Monoxide Hazard**

Use only genuine BANANZA® replacement parts per this installation, operation and service manual.

Failure to follow these instructions can result in death, electric shock, injury or property damage.

FIGURE 78: Control Panel Layouts

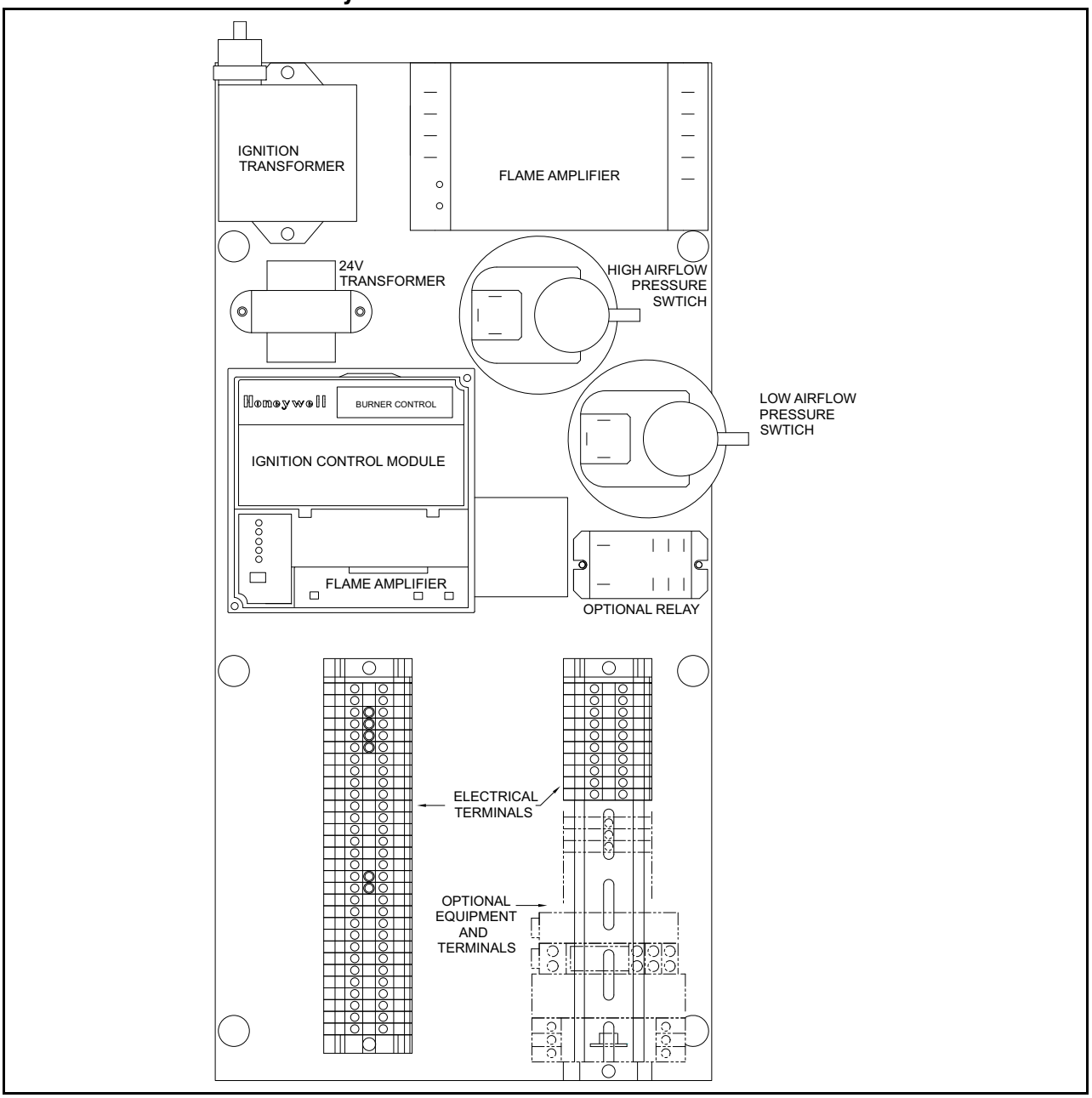


Table 26: Control Panel

Description	Models	Part Number
Pressure Switch Low Airflow	All Models	90439802
Pressure Switch High Airflow	All Models	90439814
Maxitrol 1014 (Temp Control Amp)	Units with Basic and SDC Remotes	07335
Maxitrol 1044 (Temp Control Amp)	Units with DTC Remotes	07336
Mixing Tube	All Models (*See Page 134, Figure 80*)	07380
Discharge Air Sensor 1014	Units with Basic and SDC Remotes (not shown) (*See Page 134, Figure 80*)	07350
Discharge Air Sensor 1044	Units with DTC Remotes (not shown) (*See Page 134, Figure 80*)	07410
24 V Transformer 40 VA	All Models	90407100
Ignition Transformer	All Models	90407219
Belimo LF120-S US	B-350 - B-3000	07097
Belimo NF120-S US	B-650 - B-3000	07095
Actuator 90 in. Lb Floating	B2000 - B-5000	90667110
Actuator 90 in. Lb 4-20mA	B2000 - B-5000	90667120
Actuator 90 in. Lb 24V	B2000 - B-5000	90667130
Ignition Control Module	B-350	07630
Ignition Control Module RM7890	B-650 and B-1000	07122
Ignition Control Module RM7897	B-2000 - B-5000	07130
Flame Amplifier R7849A	B-650 - B-5000	07123
Flame Rod	B-350	07590
UV Scanner	B-650 - B-5000	07060
Purge Timer 7 seconds	B-2000 - B-5000	07133
High Temperature Limit Switch	All Models	07063
Igniter	All Models	07640
Relay 15Amp	All Models	07100
Relay 8Amp	All Models	90447110
Relay Socket	All Models	90447200

FIGURE 79: Power Panel Layout

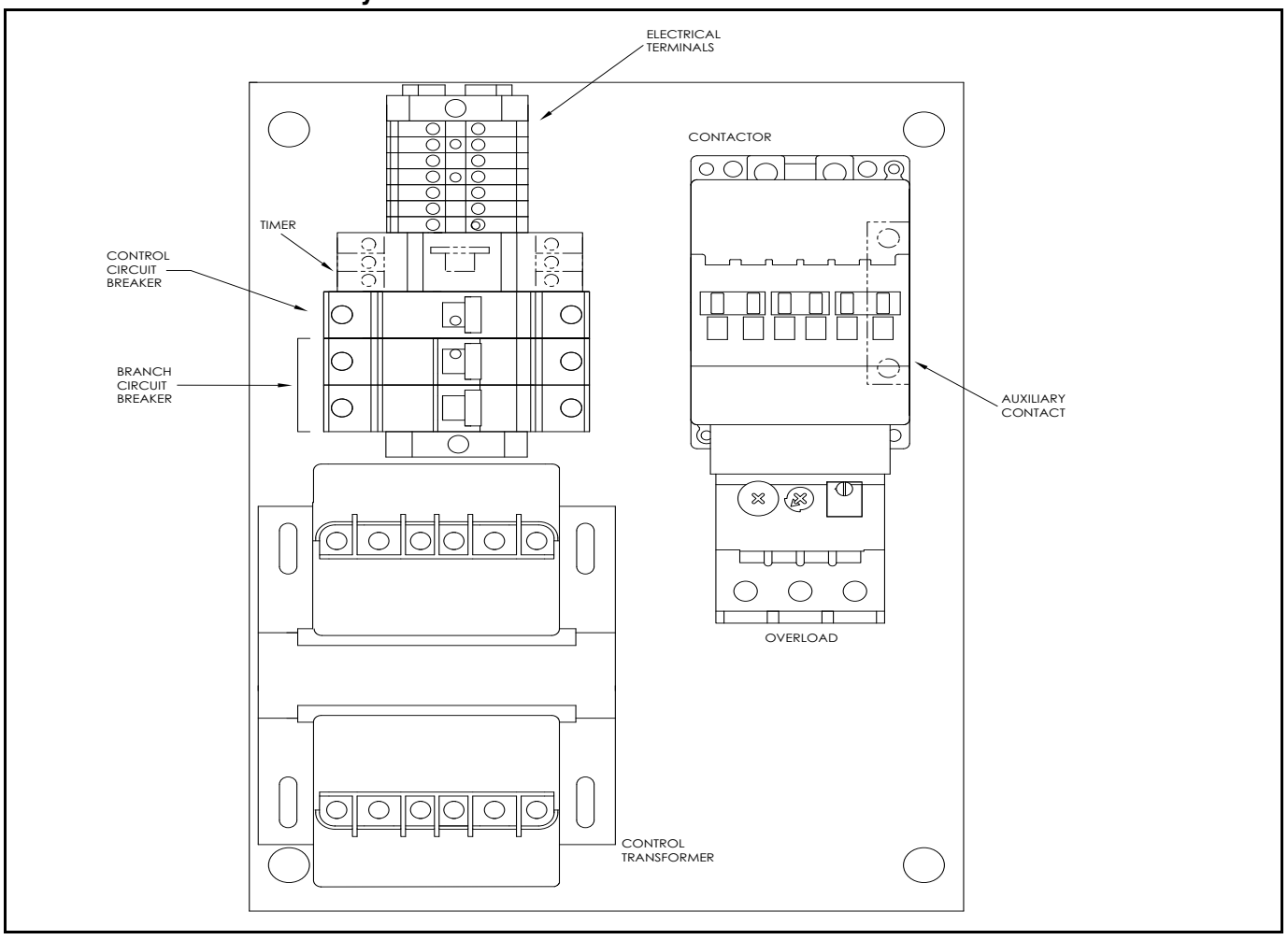


Table 27: Power Panel

Voltage	Description	B-350 - B-3000								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
208/3/60	Disconnect	08036		08040				08038	08041	
	Contactor	90600200			90600205	90600210		90600215		90600220
	Aux Contact	N/A				90447000				
	Overload	90446010			90446025	90446035	90446040	90446045	90446050	90446055
	Branch Circuit Breaker	91300500								
	Control Circuit Breaker	90300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90407205								
	Timer	90445000								

Voltage	Description	B-350 - B-3000								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
230/3/60	Disconnect	08036		08040				08038	08041	
	Contactor	90600200			90600205	90600210		90600215		90600220
	Aux Contact	N/A				90447000				
	Overload	90446005	90446015	90446020	90446025	90446030	90446035	90446045	90446050	
	Branch Circuit Breaker	91300510								
	Control Circuit Breaker	90300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90407205								
	Timer	90445000								

Voltage	Description	B-350 - B-3000								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
460/3/60	Disconnect	08039						08037		
	Contactor	90600200					90600205		90600210	
	Aux Contact	N/A							90447000	
	Overload	90446005		90446005	90446015	90446020	90446025	90446030	90446035	
	Branch Circuit Breaker	91300520								
	Control Circuit Breaker	91300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90472050								
	Timer	90445000								

Voltage	Description	B-350 - B-3000								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
575/3/60	Disconnect	08039						08037		
	Contactor	90600200						90600205		90600210
	Aux Contact	N/A							90447000	
	Overload	90446000		90446005	90446015	90446020	90446025	90446030	90446035	
	Branch Circuit Breaker	91300530								
	Control Circuit Breaker	91300490								
	250 VA Ctrl Transformer	9047210								
	350VA Ctrl Transformer	90407215								
	Timer	90445000								

Voltage	Description	B-350 - B-3000				
		2HP	3HP	5HP	7.5HP	10HP
230/1/60	Disconnect	08036		08040		08038
	Contactor	90600200		90600205	90600210	
	Aux Contact	N/A			90447000	
	Overload	90446015	90446020	90446030	90449035	90446040
	Branch Circuit Breaker	91300510				
	Control Circuit Breaker	91300490				
	250 VA Ctrl Transformer	90407200				
	350VA Ctrl Transformer	90407205				
	Timer	90445000				

Voltage	Description	B-4000/B-5000					
		15HP	20HP	25HP	30HP	40HP	50HP
208/3/60	Disconnect	25102			25107		
	Contactor	30886		30887	25065		25066
	Aux Contact	30888					
	Overload	27276			25077	25078	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	B-4000/B-5000					
		15HP	20HP	25HP	30HP	40HP	50HP
230/3/60	Disconnect	25098	25102		25107		
	Contactor	30885	30886	30887	25065		25066
	Aux Contact	30888					
	Overload	27275	27276		25077	25078	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	B-4000/B-5000					
		15HP	20HP	25HP	30HP	40HP	50HP
430/3/60	Disconnect	25086	25098			25107	
	Contactor	25264	30883	30884	30885	30886	30887
	Aux Contact		30888				
	Overload	27273	27274			27276	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	B-4000/B-5000					
		15HP	20HP	25HP	30HP	40HP	50HP
575/3/60	Disconnect	07204	07242			07243	
	Contactor	25264	30883	30884	30885	30886	30887
	Aux Contact		30888				
	Overload	27273	27274			27276	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Table 28: Manifold Components

Model	B-350	B-650	B-1000	B-2000	B-3000	B-4000 and B-5000			
Manifold Size NPT	.75"	1.0"	1.25"	1.5"	2.0"	1.5"	2.0"	2.5"	3.0"
Safety Shut Off Valve (SSOV)	-	ANSI 90076020	ANSI 90076021	ANSI 90076022	ANSI 90076023	25248	22253	22254	22254
	-	FM,XL(IRI) 90076010	FM,XL(IRI) 90076011	FM,XL(IRI) 90076012	FM,XL(IRI) 90076013				
SSOV Actuator	-	-	-	-	-		07160	07160	07160
SSOV Adapter	-	07196	07197	07198	07199		22252	22250	22251
Modulating Valve	07440	07485.3	07490.3	07500.3	07500.3	07500.6	07505.6	07510.6	07515.6
Regulator	07185								
Pilot Regulator	07552	07552	07552	07552	07552	28311	28311	28311	28311
Pilot Solenoid	07523	07522	07522	07522	07522	07522	07522	07522	07522
Manual Gas Valve (Main)	62019	62021	62034	62035	62023	30004	30005	30006	30007
Manual Gas Valve (Pilot)	62016	62016	62016	62016	62016	30000	30000	30000	30000

FIGURE 80: Blower Layout

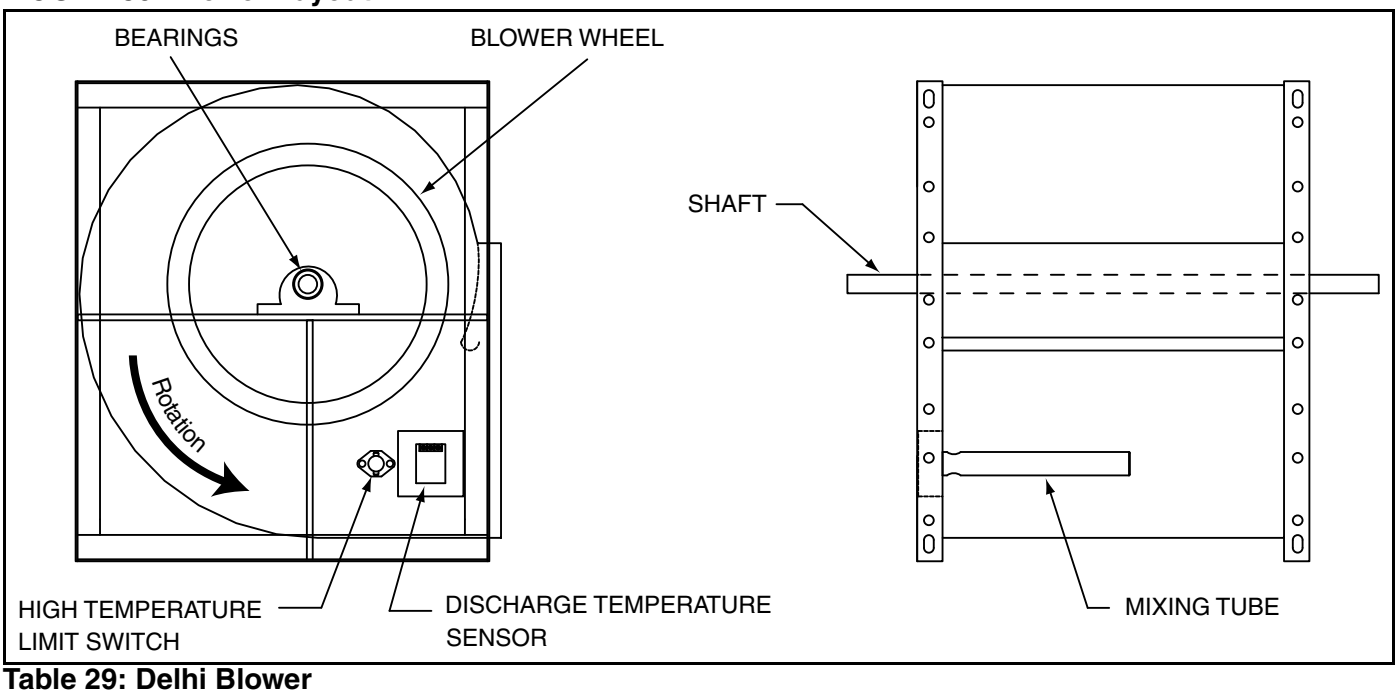


Table 29: Delhi Blower

Model	B-350		B-650 / B-1000	B-2000	B-3000	B-4000	B-5000
Blower	G9	G12	918	925	930	925-2	930-2
Assembly Part Number	62924	62923	62920	62037	62420	08510	08509
Bearing	-	-	05544	05545	05546	Contact Factory	
				05545T	05546T		
				05545L	05546L		
Shaft	-	-	05593	05594	05596	Contact Factory	
				05594T	05596T		
				05594L	05596L		
Wheel	-	-	06020	06025	06026	Contact Factory	
				06025T	06026T		
				06025L	06026L		

Table 30: Remote Panel

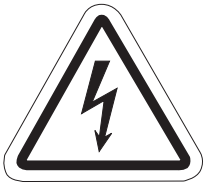
Description	Remote Panel	Part Number
Rocker Switch Center Off DPDT	SDC & DTC	22038
Rocker Switch DPST	All	22039
Remote Temperature Selector	DTC	22664
Thermostat with Timer	DTC	22670
Amber Status Light	All	18663
Temperature Selector	Basic Remote & SDC	07345
Thermostat	SDC	83200052
20VA Transformer	DTC	90436900
Terminal Block	All	91300121

Table 31: V-Belt

Description	Part Number
V-Belt B78	04312
V-Belt B80	04313
V-Belt B83	04314
V-Belt B81	04315
V-Belt B103	04319
V-Belt B105	04320
V-Belt B108	04321
V-Belt B136	04330
V-Belt BX128	04352
V-Belt BX136	04354
V-Belt B140	04358
V-Belt B70	04359
V-Belt B72	04360
V-Belt BX144	04361
V-Belt B74	04362
V-Belt BX78	04363
V-Belt B76	04634
V-Belt B100	04380
V-Belt BX112	04467
V-Belt BX133	04477
V-Belt BX120	04508
V-Belt BX123	04510

SECTION 22: TROUBLESHOOTING

⚠ DANGER

	
Electrical Shock Hazard	**Severe Injury Hazard**
Disconnect electric before service. **More than one disconnect switch may be required to disconnect electric from equipment.** **Equipment must be properly grounded.**	**Do not enter equipment while in operation.** **Equipment may start automatically.** **Do not operate with door open.** **Installation, operation and service must be done by a trained technician only.**

Failure to follow these instructions can result in death, electrical shock or injury.

⚠ WARNING

Explosion Hazard	**Fire Hazard**	**Falling Hazard**	**Burn Hazard**	**Cut/Pinch Hazard**
Turn off gas supply to equipment before service.	**Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.** **Some objects will catch fire or explode when placed close to equipment.**	**Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**

Failure to follow these instructions can result in death, injury or property damage.

22.1 Initial Checks

When encountering any abnormal operation or fault conditions of the equipment, all troubleshooting should start with the following initial checks. If a problem is discovered in these initial checks it must be corrected before moving on in the trouble shooting.

1. Compare voltage and phase of supply power on site with rating plate information.
2. Review wiring between remote panel and control panel. Do the electrical connections match the supplied wiring diagram?
3. Compare gas type and supply pressure on site with rating plate information.
4. Check for proper blower rotation on air handler and any exhaust blowers.
   - Blowers powered with a three phase motor can be reversed by swapping any two incoming power legs. For blowers powered by a single phase motor refer to the motor rating plate for reversing instructions.

22.2 Motor and Blower

PROBLEM	POSSIBLE CAUSE	SOLUTION
Motor does not operate	Main disconnect switch is OFF	Turn disconnect to ON
	Blown fuse(s) in disconnect	Replace fuse(s)
	Blown fuse(s)/breaker tripped in control transformer	Replace fuse(s)/reset breaker (with disconnect off)
	Fan switch on, Power on terminals 3 / 3A	Check wiring between remote panel and air handler. Replace switch.
	Cool down timer TD4 (if equipped) does not reset. Power on 3A?	Replace TD4 timer
	Optional: Damper does not open	Check that damper is not obstructed Check that linkage is tight and secure Verify that 120 V at terminal 3B Replace damper actuator
	Time delay relay defect. Power on terminal 3D after set time delay?	Replace time delay relay TR1
	Motor starter (contactor) does not operate. Power on terminal 3D and 2?	Replace starter
	Tripped motor overload. Power out to MUA motor when motor starter is energized?	Reset Check for proper FLA setting Replace overload If applicable: Tighten screws on heater packs or overload.
	Optional: Low limit switch set to high	Re-adjust low limit switch setting
Blower does not operate	Belts broken or loose?	Replace/tighten belts
	Loose motor or blower sheaves (pulleys)	Reinstall and properly torque set-screws
	Blower bearings, do they turn freely?	Replace bearing(s)

22.3 Burner

PROBLEM	POSSIBLE CAUSE	SOLUTION
Flame control does not try for ignition	Auxiliary contact "M1" not closed. Power on terminal "4"?	Properly mount contact or replace
	Burner/winter switch closed? Power on terminal "7"?	Replace switch
	High temp limit switch tripped? Power on terminal "8"?	Manually reset or replace
	Low airflow pressure switch contacts not made. Power on terminal "8A"?	Check blower operation Reconnect tubes to pressure switch Clean pressure test tubes Check filters/duct work for restrictions
	High airflow pressure switch contacts are open. Power on terminal "9"?	Check blower FLA and compare to data plate. Cabinet pressure too high check system setup and for restrictions down stream of blower.
	Optional: Mild weather stat, dial set to low	Set dial higher Replace stat
	Optional: High gas pressure switch	Manual reset Verify gas pressure
	Optional: Low gas pressure switch	Manual reset Verify gas pressure
	No power between terminals 3 and L2 (neutral) or 6 and L2 (neutral) for RM7890A (5 and L2 (neutral) or 7 and L2 (neutral) for RM7897C) of the burner control base	Verify wiring
	Flame control defect	Replace
Burner Lockout	Failure to ignite pilot or main flame. Flame control failure.	Reset the flame control module at the unit and proceed to the next step, observing the unit to indicate at which step lockout condition occures.
No PILOT flame	UV flame sensor indicating presence of flame before ignition. Flame indicator light present? Is there 5Vdc on UV flame amplifier?	Separate spark wire and UV scanner wires. Replace UV flame sensor, UV flame amplifier or burner control.
	No spark	Check wiring from burner control to ignition transformer Check high tension wire to spark plug Replace ignition transformer
	No gas	Open manual gas shut off valves Check wiring from burner control to pilot gas valve Verify inlet gas pressure Adjust pilot gas pressure Replace pilot gas valve Check burner pilot opening for obstruction
Pilot flame does not stay lit	Improper pilot gas pressure	Adjust pilot gas pressure
	UV flame scanner does not detect flame, Is there 5Vdc on UV flame amplifier?	Replace UV scanner Replace UV flame amplifier
	UV flame scanner dirty	Clean UV scanner

Burner (continued)

PROBLEM	POSSIBLE CAUSE	SOLUTION
No main flame	Manual shut off valve closed	Open manual shut off valve
	Safety Shut Off Valve not operating. Is there positive gas pressure downstream of SSOV?	Check wiring from burner control to SSOV Verify inlet gas pressure Replace SSOV
	Minimum gas supply pressure	Verify minimum gas supply pressure as per data plate is available
	Burner openings obstructed	Remove obstruction Clean burner orifice holes
	Improper burner low fire adjustment on modulating valve	Adjust low fire as per the relevant Maxitrol temperature control instructions.

22.4 Temperature Controls

If temperature control problems occur and are not remedied in the troubleshooting procedure, refer to the trouble shooting table for the unit specific temperature control amplifier.

1. For units with the Maxitrol series 14 temperature control amplifier, refer to the Field Service Check List for Series A1014 Amplifiers. Series 14 Amplifiers are supplied on units equipped with Basic and SDC style remote panels.
2. For units with the Maxitrol series 44 temperature control amplifier, refer to the Field Service Check List for Series A1044 Amplifiers. Series 44 Amplifiers are supplied on units equipped with DTC remote panels.

If problems persist after performing the troubleshooting procedure and the temperature control amplifier troubleshooting procedure contact the factory.

22.5 A1014 Amplifier - Field Service Checklist

SYMPTOM		POSSIBLE CAUSE
A.	No Gas Flow	1. Modulating valve improperly installed.
B.	Continuous Low Fire (electronics problem).	2. Short circuit or no voltage to the amplifier. 3. Open circuit in TD114. Remote Temperature Selector circuit or wiring. 4. Short circuit in TS114, Discharge Air Sensor circuit or wiring. 5. Faulty amplifier.
C.	Continuous Low Fire (electronics ok)	6. Short circuit or open circuit in Modulator Coil. 7. Plunger missing, jammed or improperly installed.
D.	Incorrect Minimum Fire Erratic or Pulsating Flame.	8. Incorrect by-pass metering valve adjustment. 9. Excessive negative burner pressure.
E.	Continuous High Fire (electronics problem).	10. Short circuit in TD114 Remote Temperature Selector circuit or wiring. 11. Open circuit in TS114/TS10765. Discharge or Inlet Air Sensor Circuit or wiring. 12. Jumper not connected across amplifier terminals 2 and 3.
F.	Continuous High Fire (electronics ok).	13. Foreign object holding valve open. 14. Plunger jammed.
G.	Incorrect Maximum Fire.	15. Inlet pressure too low. 16. Incorrect outlet pressure adjustment of Pressure Regulator.
H.	Erratic or Pulsating Flame.	17. Hunting 18. Erratic air patterns or improper TS114 location. 19. Wiring is run next to high voltage switching circuits causing induced voltages. 20. Faulty Amplifier or erratic voltage supply.
I.	Incorrect Discharge Air Temperature	21. Inlet Air Sensor is used. 22. Incorrect Wiring. 23. System out of calibration. 24. Improper TS114 location. 25. Room Override Thermostat circuit closed.
J.	Burned out Transformer.	26. Short circuit in modulator coil. 27. Short circuit between amplifier and modulator valve.
K.	Discharge Air Temperature too Low when T115 is Operative	28. Too low an Override Temperature setting. 29. Burner capacity may be insufficient.

FIELD TEST	REMEDY
1. Arrow on side of Valve should point in direction of gas flow.	1. Install properly.
2. Check for 24V AC at amplifier terminals 7 & 8. 3. Inspect for loose or broken wires between amplifier terminals 1 & 2, and TD114 terminals 1 & 2, and TD114 terminals 1 and 3. 4. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Follow procedure outlined. 5. Check items 2, 3, and 4.	2. Prove the power source. 3. Tighten connections or replace wiring. 4. If modulating voltages are obtained, Check TS114 circuit for shorts. Replace TS114 if necessary. 5. If items 2, 3, and 4 check out and modulating voltages are still not obtained, amplifier may be assumed faulty. Replace.
6. Measure resistance across modulator terminals with connecting wires detached. 7. Inspect. Plunger should be installed per diagrams in Maxitrol information sheet and operate freely in solenoid sleeve.	6. Replace modulator head if not approximately 45-55 ohms for M611 Valve and 60-80 ohms for MR212 Valve. 7. Clean or replace plunger if necessary. Install per Maxitrol product information sheet.
8. See valve adjustments in Section 19.5. 9. Measure manifold pressure as outlined in Section 19.4.	8. Adjust to proper minimum fire. 9. If reading is greater than 1.0 in wc negative pressure, check for clogged filters or other inlet air restrictions. Consult factory for other solutions.
10. Inspect for shorts at or between Amplifier terminals 1 & 2 or TD114 terminals 1 & 3. 11. Check TS114/TS10765 for open internal circuit. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Follow procedure outlined. 12. Inspect	10. Correct wiring if shorts exist. 11. If modulating voltages are obtained, check TS114/TS10765 for open circuits. Replace TS114/TS10765. 12. Correct the wiring.
13. Remove button plate and inspect valve and seat. 14. Inspect. Plunger should be smooth, clean, and operate freely in solenoid sleeve.	13. Clean seat. Clean valve or replace if necessary. 14. Clean, or if necessary, replace plunger.
15. Read pressure at inlet to modulating valve using a manometer with unit operating at full fire. Pressure should be equal to the sum of outlet pressure setting plus pressure drop of the valve (see Maxitrol capacity chart). 16. Read manifold pressure using manometer and compare with recommendation of equipment manufacturer.	15. Increase inlet pressure if possible. 16. See valve adjustments in Section 19.5.
17. Adjust sensitivity control counter-clockwise. 18. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Turn TD114 selector dial so heater goes through its entire modulating range. 19. Temporarily wire each of TD114, TS114, and MR212 externally and observe heater/equipment operation. 20. With test resistor connected (per item #18) and TD114 locally connected (per item #19), turn TD114 selector dial through entire modulating range. Observe D.C. voltage across modulator terminals.	17. If flame stabilizes, adjust sensitivity control to maintain an even flame. 18. If the flame is steady throughout the entire modulating range, the TS114 must be moved. 19. If smooth operation results, isolate effected wiring from source of induced voltage. 20. If erratic or unstable D.C. voltages are obtained throughout the modulating range, the amplifier may be assumed faulty. Replace. If erratic operation is noted only over a small range of 2 or 3 volts, the voltage source may contain surges. Consult Maxitrol
21. Inlet Air Sensor changes 1°, for each 3.5°, 5°, or 8° outside temperature change from 60° (pre-determined - turndown varies with model used). 22. Check wiring diagrams page 7. 23. Sensed temperature (thermometer next to TS114) does not correspond to TD114 setting. 24. Sensed temperature (thermometer next to TS114) does not represent average discharge air temperature. 25. Remove Override Thermostat lead from terminal 2 of TD114.	21. Sensed temperature will vary from TD114 dial settings. This is intentional. 22. Correct wiring. 23. See calibration procedure. 24. Move TS114 to location where average representative temperature can be sensed. 25. TD114 dial setting, then check thermostat setting and/or check wiring for shorts.
26. Measure resistance across modulator terminals with red lead wires disconnected. 27. Inspect wiring.	26. Replace modulator head if less than 40 ohms. 27. Correct wiring if short is found.
28. Check “Override Temperature Selector” of TD114. 29. Check for high fire (Maximum manifold pressure specified for heater).	28. Reset to correct temperature. 29. If on high fire, control can do no more. Heater unable to furnish additional heat to raise temperature.

22.6 A1044 Amplifier - Field Service Checklist

SYMPTOM		POSSIBLE CAUSE
A.	No gas flow.	1. Valve improperly installed.
B.	Continuous low fire (electronics ok).	2. Open circuit in modulator coil. 3. Plunger missing, jammed or improperly installed. 4. Ruptured main or balancing diaphragm.
C.	Continuous Low Fire (electronics problem)	5. No voltage to the amplifier. 6. Short in modulator coil circuit. 7. Short in TS144 circuit. 8. Faulty amplifier.
D.	Incorrect Low Fire	9. Incorrect by-pass metering valve adjustment. 10. Excessive negative burner pressure.
E.	Continuous Minimum Discharge Air Temperature	11. Faulty amplifier. 12. Short in T244 or TS244/TD244 circuit 13. Incorrect space temperature calibration.
F.	Incorrect Max. or Min. Discharge Air Temperature.	14. Improper TS144 location. 15. Incorrect discharge air temperature calibrations
G.	Continuous High Fire (electronics ok)	16. Foreign material holding valve open. 17. Plunger jammed.
H.	Continuous High Fire. (electronics problem)	18. Open circuit in TS144
I.	Incorrect High Fire	19. Inlet pressure too low. 20. Incorrect outlet pressure adjustment.
J.	Continuous Maximum Discharge Air Temperature	21. Faulty amplifier. 22. Open circuit in T244 to TS244/TD244 23. Incorrect space temperature calibration.
K.	Burned out Transformer. No Voltage to Amplifier	24. Short in modulator coil circuit.
L.	Incorrect Space Temperature.	25. Incorrect maximum discharge air temperature setting (A1044). 26. Incorrect minimum discharge air temperature setting (A1044). 27. Insufficient burner capacity. 28. Incorrect space temperature calibration.

*Control circuits external to the Series 44 can cause burner malfunction. Always check manual valve to be certain gas is on, and check limit controls for normal operation.

FIELD TEST	REMEDY
1. Arrow on side of valve should point in direction of gas flow.	1. Install properly.
2. Remove wires connected to amplifier terminals 6 & 7 and measure resistance. MR212 (60-80 ohms), M611 (45-55 ohms). 3. Inspect - plunger should be installed per Maxitrol product information sheet and operate freely in solenoid sleeve. 4. Disassemble valve for inspection of internal parts.	2. If proper resistance values are not observed, replace modulator head or repair wiring. 3. Clean or replace plunger if necessary and install per Maxitrol product information sheet. 4. Replace diaphragm if ruptured.
5. Check for 24V AC at amplifier terminals 8 & 9. 6. Measure resistance per item 2. 7. Remove wires connected to amplifier terminals 1, 2, & 3. Measure resistance across wires 1 & 3, then 2 & 3. Meter should read greater than 2500 ohms. 8. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections I & II) in Maxitrol product information sheet.	5. Provide 24V AC to amplifier. Refer to item 24. 6. If proper resistance values are not observed, replace modulator head or repair wiring. 7. If readings are incorrect, replace the TS144 or repair wiring. 8. If power source and modulator coil check out (items 5 & 6) but proper modulating voltages cannot be obtained, then amplifier may be assumed at fault. Install replacement amplifier.
9. See Valve Adjustments - Section 19.5. 10. Measure manifold pressure as outlined in Section 19.4.	9. Adjust to proper low fire. 10. If greater than 1.0 in. wc negative pressure, check equipment for clogged filters & other inlet air restrictions. For other solutions, consult factory.
11. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (sections I & II), in Maxitrol product information sheet. 12. Remove wires connected to amplifier terminals 4 & 5. Set T244 or TD244 to maximum setting. Measure resistance across wires. Meter should read 6000 ohms +/- 1000 (T244). If TS244/TD244 are used, meter should read 4500 ohms +/- 1000 (TS244) and 2100 ohms +/- 150 (TD244). 13. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections IV), in Maxitrol product information sheet.	11. If amplifier is proven at fault, install replacement amplifier. 12. If reading is incorrect, replace the T244, TS244/TD244 or repair wiring. 13. If proper action is obtained, first check item 12. Recalibrate if necessary See section 19.7.
14. Compare sensed temperature reading at TS144 with average discharge air temperature. 15. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections IV), in Maxitrol product information sheet.	14. Move TS144 to location where average temperature can be sensed. 15. If proper temperatures are not observed, refer to temperature calibration procedures, in Maxitrol product information sheet.
16. Remove button Plate and inspect valve and seat 17. Inspect - plunger should be smooth and clean and operate freely in solenoid sleeve.	16. Clean, replace valve and/or seat if necessary. 17. Clean, or if necessary, replace plunger.
18. Measure resistance per item 7.	18. If readings are incorrect, replace the TS144 or repair wiring.
19. Read inlet pressure at valve, using a manometer with heater operating at full fire. Pressure should be at least equal to the sum of: outlet pressure setting and pressure drop of the valve (See Maxitrol Capacity Chart Bulletin) plus 1.0 in. wc o.k.. 20. Read outlet pressure using manometer and compare with recommendation of equipment manufacturer.	19. Increase inlet pressure if possible or change to larger valve. Consult Maxitrol about possibility of using special spring to reduce pressure drop on selected installations. 20. See valve adjustments in section 19.5.
21. Follow procedure outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections I & II), in Maxitrol product information sheet. 22. Measure resistance per item 12. 23. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS: (Section IV), in Maxitrol product information sheet.	21. If amplifier is proved at fault, install replacement amplifier. 22. If reading is incorrect, replace the T244, TS244/TD244 or repair wiring. 23. If proper action is obtained, first check item 22. Recalibrate if necessary. Refer to Temperature Calibration Proceedures in Maxitrol product information sheet
24. Measure resistance per item 2.	24. If proper resistances are not observed, replace modulator head or repair wiring.
25. Check to see if heater is delivering air at maximum discharge air setting. 26. Check to see if heater is delivering air at maximum discharge air setting. 27. Check to see if heater is operating at high fire. 28. Place thermometer next to T244 or TS244. Compare space temperature reading with T244 or TD244 dial setting.	25. If desired temperature is not reached, increase maximum discharge air temperature setting. 26. If desired space temperature is not reached, decrease minimum discharge air temperature setting. 27. If desired space temperature is not reached with heater at high fire, it may be undersized. Consult equipment manufacturer. 28. If temperature reading is incorrect, check items 25, 26, & 27, then recalibrate if necessary.

22.7 BANANZA® B-Series Start-Up Procedures

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BANANZA® B-SERIES START-UP PROCEDURES

Date of Installation: _____ **Model #** _____ **Serial #** _____

Installed at:		**Service Company:**	
Name:	_____	**Name:**	_____
Address:	_____	**Address:**	_____
Phone:	_____	**Phone:**	_____
Fax:	_____	**Fax:**	_____

Notice: Please return a completed copy to Bananza. If this document is not returned, the manufacturing date will be used as the warranty start date.

⚠ WARNING

Explosion Hazard **Leak test all components of equipment gas piping before operation.** **Gas can leak if piping is not installed properly.** **Do not high pressure test gas piping with equipment connected.**	**Carbon Monoxide Hazard** **Do not recirculate air from the heated space over burner.** **Air supply to burner must be from outside.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Burn Hazard** **Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**

Failure to follow these instructions can result in death, injury or property damage.

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

Receiving Inspection

Check installation site to ensure all codes and engineering specifications are correct. Place a check next to line items completed or enter data.

1. Inspect air handler and all accessories for possible shipping damage. No Damage___ Damaged ___. (Specify on separate sheet.)

2. Check packing list against items received. OK ___ Missing items ____ (Call factory.)

3. Check all nuts, bolts and fasteners to ensure they are tight. OK ____ Loose____ (Specify.)

4. Check sheaves, set screws and bearing collars. Make sure they are tight. OK ____ Loose ____ (Specify.)

5. Compare voltage on unit rating plate to job site voltage. Job Site Voltage _____/____/_____.

6. Compare gas type and supply pressure on unit rating plate to job site gas supply. Job Site Gas Type____ Supply Pressure_____

7. Check lifting brackets to make sure they are tight and secure before lifting heater. OK ____ .

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BANANZA® B-SERIES START-UP PROCEDURES (continued)

8. For FR, AM models: CO2 sensor installed?
   OK ____

The following procedures reference pages and tables from the B-Series Installation, Operation and Service Manual (P/N BN121100NA). Contact the local BANANZA® independent distributor or Bananza for a manual.

At Start-up:
Verify proper belt tension and sheave alignment per instructions on Page 118, Section 19.2.
OK _____.

Verify proper torque on all sheaves per table on Page 119, Section 19.4.
OK _____.

Air Temperature Sensing:
1. The sensing probe is factory mounted in the blower housing. (Advance to next section.)

Electrical (Page 119, Section 19.3)
1. Check all motor starters for proper overload settings. The overload should not exceed Full Load Amps for the motor. _____ A.

2. What is the supply voltage to the air handler?
   Air Hander Off _____ #1_____#2 _____ #3 _____
   Air Hander On _____ #1_____#2 _____ #3 _____

3. Verify correct fan rotation. OK _____.

4. What is total system current draw?
   Motor current draw (Burner Off)? _____.
   Burner and motor current draw? _____.

5. Compare all variable frequency drive (VFD) programming parameters with specifications provided on electrical drawing. OK _____.

6. For VFD systems, make sure to set programming parameters for proper overload protection (See VFD Instruction Manual). OK _____.
7. If more than one exhaust motor is used with one VFD, each motor must have its own overload protection. OK _____.

Differential Pressure: (Page 119, Section 19.4.1)
1. In order to verify proper airflow across the burner, the differential pressure across the profile plate needs to be measured. Attach a manometer to the pressure test ports where the pressure switch is attached and measure the differential pressure with a manometer. This reading must be 0.9 in wc +-0.1 in wc (2.24 +/- 0.25 mbar)
Record differential box pressure _____ in. wc/mbar

Burner Pressure: (Page 120, Section 19.4.2)
1. A pressure tap between the Maxitrol modulating valve and the burner is used to measure negative airflow at the burner and to set high fire gas pressure. This tap could also be located on the Maxitrol valve itself, manual shut off valve or "T" fitting. See unit data plate on control enclosure door for high fire setting.

2. Record burner pressure with inlet manual gas valve off and blowers on _____ in wc/mbar

Page 2 of 2

Gas Piping and Initial Pressure Setting:
(Page 120, Section 19.5)
1. Perform a pressure test on all gas supply lines to air handler per local codes. OK _____.

2. Verify supply pressure does not exceed maximum rated gas pressure as stated on the rating plate. OK_____.

3. Set the supply gas pressure at the step down regulator (normally outside of the enclosure if one is installed), according to the rating plate inlet gas pressure specifications.
   Fuel Type: _____ Pressure: _____.

4. Only after performing steps 1-3, open the main gas valve and close the manual gas valve downstream of the MR valve. Set the burner switch to on. Verify pilot pressure, and flame signal of 5.0 VDC. OK _____.

   (To adjust pilot flame, set pilot regulator to 1.0 in wc (2.5 mbar) natural gas or 0.5 in wc (1.25 mbar) L.P. gauge pressure.

5. Open both manual gas valves at air handler. Force the burner into high fire. See Page 121, Table 22, "Burner Mode By Amplifier Type". Read the gas pressure at the MR valve and set according to the determined high fire gas pressure in Table 22. The small cap screw is for high fire on MR212 valve only. Take a reading of the temperature rise. Temperature rise must be in accordance with Table 23.
   High Fire Discharge Temperature _____°F/°C
   _____Manifold Pressure for Maximum Input (from rating plate)
   _____Burner Pressure
   _____High Fire Gas Pressure Setting

There are three critical items to consider before adjusting low fire:

A. Low fire adjustment does not regulate gas pressure.

B. If the low fire adjustment screw is set to maximum, high fire regulation problems will occur.

C. The burner control system must be forced into low fire per Maxitrol's instruction for the given amplifier/temperature control system. See Page 121, Table 22, "Burner Mode By Amplifier Type". *

7. Low fire is set at the MR212 valve using the adjustment screw under the large cap screw, or on the M611 valve using the brass adjusting screw on the side. The burner must be forced into low fire first. The low fire ribbon across the burner must be adjusted. OK_____.

Once gas pressure and high/low fire adjustments are made, the gas setup is completed. All taps and instruments must be removed and all caps and plugs must be replaced.

Please leave all manuals and
a copy of this sheet with the air handler!

Technician's Name:_____

Signature:_____

Date:_____

SECTION 23: THE BANANZA® B-SERIES WARRANTY

BANANZA WILL PAY FOR:

Within 24 months from date of purchase by buyer or 27 months from date of shipment by Bananza (whichever occurs first), replacement parts will be provided free of charge for any part of the product which fails due to a manufacturing or material defect.

Bananza will require the part in question to be returned to the factory. Bananza will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

BANANZA® Replacement Parts are warranted for a period of 12 months from date of shipment from Bananza or the remaining BANANZA® B-Series warranty.

BANANZA WILL NOT PAY FOR:

Service trips, service calls and labor charges.

Shipment of replacement parts.

Claims where the total price of the goods have not been paid.

Damage due to:

- Improper installation, operation or maintenance.
- Misuse, abuse, neglect, or modification of the BANANZA® B-Series in any way.
- Use of the BANANZA® B-Series for other than its intended purpose.
- Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty.
- Improper service, use of replacement parts or accessories not specified by Bananza.
- Failure to install or maintain the BANANZA® B-Series as directed in the Installation, Operation and Service Manual.
- Relocation of the BANANZA® B-Series after initial installation
- Use of the BANANZA® B-Series in a corrosive atmosphere containing contaminants.
- Use of the BANANZA® B-Series in the vicinity of a combustible or explosive material.
- Any defect in the BANANZA® B-Series arising from a drawing, design, or specification supplied by or on behalf of the consumer.
- Damage incurred during shipment. Claim must be filed with carrier.

WARRANTY IS VOID IF:

The BANANZA® B-Series is not installed by an contractor qualified in the installation and service of gas fired heating equipment.

You cannot prove original purchase date and required annual maintenance history.

The data plate and/or serial number are removed, defaced, modified or altered in any way.

The ownership of the BANANZA® B-Series is moved or transferred. This warranty is non-transferable.

Bananza is not permitted to inspect the damaged equipment and/or component parts.

READ YOUR INSTALLATION, OPERATION AND SERVICE MANUAL.

If you have questions about your equipment, contact your installing professional. Should you need Replacement Parts or have additional questions, call or write:

Bananza
1100 Seven Mile Road NW
Comstock Park, MI 49321
+1.616.784.0500
800.255.3416
On the web at: www.bananza.com

Bananza's liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Bananza shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the BANANZA® B-Series . Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

Bananza shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts or power. No person is authorized to assume for Bananza any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:

No representative of Bananza, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Bananza's duly authorized Executive Officer.

BANANZA

OWNER WARRANTY REGISTRATION CARD

Mail or Fax to:

Bananza • 1100 Seven Mile Road N.W. • Comstock Park, MI 49321 • Phone: 616.726.8800 • Fax: 616.726.8807
Toll Free: 800.255.3416 • www.bananza.com

About the Owner:

Name:_____

Address:_____City:_____State:_____Zip Code:_____

Phone:_____ Fax:_____ E-mail:_____

About the Installer:

Name:_____

Address:_____City:_____State:_____Zip Code:_____

Phone:_____Fax:_____E-mail:_____

Purchased From (if different than installer):

Name:_____

Address:_____City:_____State:_____Zip Code:_____

Phone:_____ Fax:_____ E-mail:_____

About your Heater:

Model#:_____ Serial #:_____ Fuel:_____ Installation Date:_____

Type of Installation (check one):

o Automotive	o Manufacturing	o Warehouse	o Recreational	o Aircraft
o Public Building	o Office	o Retail	o Agricultural	o Other_____

Installation Code and Annual Inspections: All installations and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment.

To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor annually inspect your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

These products are not approved for residential use.

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Printed in the U.S.A.

Attach this information to the wall near the BANANZA® remote panel

BANANZA

Read the Installation, Operation and Service Manual thoroughly before installation, operation or service.

OPERATING INSTRUCTIONS

1. Stop! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the air handler supply line.
3. Turn on electric to the air handler.
4. Set temperature selector and, if equipped, thermostat, to desired setting.
5. Set FAN switch to "ON".
6. Set BURNER switch to "ON".

TO OPERATE AS VENTILATOR

1. Stop! Read all safety instructions on this information sheet.
2. Turn on electric to the air handler.
3. Set FAN switch to "ON".

TO TURN OFF THE AIR HANDLER

1. If equipped, set the thermostat to the lowest setting.
2. Set BURNER switch to "OFF".
3. Set FAN switch to "OFF".

IF THE AIR HANDLER WILL NOT OPERATE, FOLLOW THESE INSTRUCTIONS, TO HELP ENSURE YOUR SAFETY

1. If equipped, set the thermostat to the lowest setting.
2. Set BURNER switch to "OFF".
3. Set FAN switch to "OFF".
4. Turn off electric to the air handler.
5. Close the manual gas valve in the air handler supply line.
6. Call your registered contractor qualified in the installation and service of gas-fired heating equipment.

⚠WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the required clearances to combustibles away from equipment.

Some objects can catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

CLEARANCES TO COMBUSTIBLES

Clearances to combustibles for Models B-350 - B-3000 are 12" (30.5 cm) on the control enclosure side and 6" (15.2 cm) on all other surfaces.

Clearances to combustibles for Models B-4000 and B-5000 are 6" (15.2 cm) on all surfaces.

Clearances to combustibles do not denote clearances for accessibility. Minimum clearance for access is 48" (122 cm) on all models. Minimum clearance for accessibility applies to the control enclosure, blower access panel and filter access panel (when equipped).

Bananza
1100 Seven Mile Road NW
Comstock Park, MI 49321
Telephone: +1.616.726.8800
Fax: +1.616.726.8807
Toll Free: 800.255.3416

Installation Code and Annual Inspections: All installation and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment. To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor conduct, at a minimum, annual inspections of your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

Air handlers are approved for installation up to 2000' (610 m).
For installations at elevations above 2000' (610 m), consult factory.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through BANANZA® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

These products are not for residential use.
This document is intended to assist licensed professionals in the exercise of their professional judgment.

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